# Notice of Construction (NOC) Worksheet

PUGET SOUND
Clean Air Agency

| | |
|---|---|
| **Applicant: Ash Grove Cement Company** | **NOC Number**: 12003 |
| **Project Location**: 3801 E Marginal Way S, Seattle, WA 98134-1113 | **Registration Number**: 11339 |
| **Applicant Name and Phone**: Marty Johnson, 206-694-6232 | **NAICS:** 327310 |
| **Engineer**: Carl Slimp | **Inspector**: Gerard Van Der Jagt |

## A. DESCRIPTION

For the Order of Approval:
Operation of One AGC-Seattle Whole Tire Feed System for injecting whole tires as replacement fuel at the Calciner level of the Preheater Tower above the Kiln, which is controlled by an existing Baghouse.

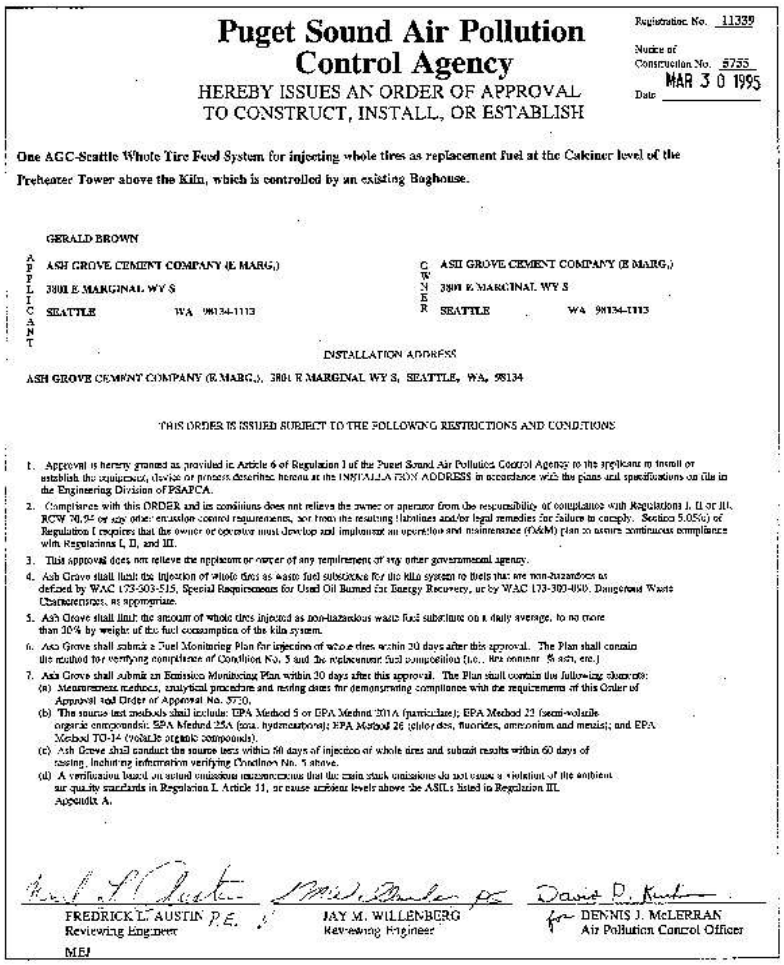
### Permit History

EU 1. 31 40 CFR 63.1349(e)(3)(i) 12/6/02 Provide Puget Sound Clean Air
Agency written notice at least 60 days prior to undertaking any operational change that may adversely affect compliance with the D/F emission standards in Conditions EU 1.26 and 1.27, or as soon as practicable where 60 days advance notice is not feasible. Notice shall include a description of the planned change, the emissions standards that may be affected by the change, and a schedule for completion of the performance test required by Condition EU 1.32, including when the planned operational change would begin.

EU 1. 32 40 CFR 63.1349(b)(3) and (e), 12/6/02
Conduct a dioxin/furan performance test whenever Ash Grove plans to undertake a change in operations that may adversely affect compliance with the D/F emission standards in Conditions EU 1.26 or 1.27. In preparation for and while conducting the performance test, the kiln and raw mill may operate under the planned operational change conditions for a period not to exceed 360 hours, provided that Ash Grove notifies Puget Sound Clean Air Agency as described in Condition EU 1.31, that the performance test results are documented in a test report containing the information listed in 40 CFR 63.1349(a), and that a test plan is made available for Puget Sound Clean Air Agency review prior to testing, if requested. The performance test must be completed within 360 hours after the planned operational change begins. Ash Grove shall submit to Puget Sound Clean Air Agency temperature and other monitoring data recorded during any period of pretest operations. II.C.8 Subpart LLL
Performance Test Reporting II.D.8 NESHAP Subpart LLL
Recordkeeping (3) 3-hour runs EPA Method 23 (40 CFR 60, Appendix A, July 1, 2002)

EU 1. 33 40 CFR 63.1349(e)(1) 12/6/02 Data collected during a performance test under Condition EU 1.32 shall be used to establish new temperature limits for the kiln, supplanting the limits established under 40 CFR63.1349(b).

6. Tire Derived Fuel Consumption
Ash Grove shall monitor the weight of whole tires injected into the kiln following the Fuel Monitoring Plan required by Order of Approval 5755, Condition 6. Report a deviation per Condition II.C.2 of AOP 11339 if the daily weight of whole tires injected during each calendar day (7 am to 7 am) exceeds 30 percent of the weight of all fuels consumed in the kiln during that day. Report the daily weight of whole tires injected per Condition II.C.11 of AOP 11339. [Order of Approval 5755, Condition No. 6 (1/11/95); WAC 173-401-615(1) and WAC 173-401- 615(2) (10/17/02)]



# Puget Sound Air Pollution Control Agency

HEREBY ISSUES AN ORDER OF APPROVAL
TO CONSTRUCT, INSTALL, OR ESTABLISH

Registration No. 11339
Notice of Construction No. 5755
Date MAR 3 0 1995

One AGC-Seattle Whole Tire Feed System for injecting whole tires as replacement fuel at the Calciner level of the Preheater Tower above the Kiln, which is controlled by an existing Baghouse.

GERALD BROWN

APPLICANT
ASH GROVE CEMENT COMPANY (E MARG.)
3801 E MARGINAL WY S
SEATTLE WA 98134-1113

OWNER
ASH GROVE CEMENT COMPANY (E MARG.)
3801 E MARGINAL WY S
SEATTLE WA 98134-1113

INSTALLATION ADDRESS

ASH GROVE CEMENT COMPANY (E.MARG.), 3801 E MARGINAL WY S, SEATTLE, WA, 98134

THIS ORDER IS ISSUED SUBJECT TO THE FOLLOWING RESTRICTIONS AND CONDITIONS

1. Approval is hereby granted as provided in Article 6 of Regulation I of the Puget Sound Air Pollution Control Agency to the applicant to install or establish the equipment, device or process described hereon at the INSTALLATION ADDRESS in accordance with the plans and specifications on file in the Engineering Division of PSAPCA.
2. Compliance with this ORDER and its conditions does not relieve the owner or operator from the responsibility of compliance with Regulations I, II or III, RCW 70.94 or any other emission control requirements, nor from the resulting liabilities and/or legal remedies for failure to comply. Section 5.05(c) of Regulation I requires that the owner or operator must develop and implement an operation and maintenance (O&M) plan to assure continuous compliance with Regulations I, II, and III.
3. This approval does not relieve the applicant or owner of any requirement of any other governmental agency.
4. Ash Grove shall limit the injection of whole tires as waste fuel substitute for the kiln system to fuels that are non-hazardous as defined by WAC 173-303-515, Special Requirements for Used Oil Burned for Energy Recovery, or by WAC 173-303-050, Dangerous Waste Characteristics, as appropriate.
5. Ash Grove shall limit the amount of whole tires injected as non-hazardous waste fuel substitute on a daily average, to no more than 20% by weight of the fuel consumption of the kiln system.
6. Ash Grove shall submit a Fuel Monitoring Plan for injection of whole tires within 30 days after this approval. The Plan shall contain the method for verifying compliance of Condition No. 5 and the replacement fuel composition (i.e., tire content % ash, etc.)
7. Ash Grove shall submit an Emission Monitoring Plan within 30 days after this approval. The Plan shall contain the following elements:
   (a) Measurement methods, analytical procedure and testing dates for demonstrating compliance with the requirements of this Order of Approval and Order of Approval No. 5720.
   (b) The source test methods shall include: EPA Method 5 or EPA Method 201A (particulate); EPA Method 22 (semi-volatile organic compounds); EPA Method 25A (tota. hydrocarbons); EPA Method 26 (chlorides, fluorides, ammonium and metals); and EPA Method TO-14 (volatile organic compounds).
   (c) Ash Grove shall conduct the source tests within 60 days of injection of whole tires and submit results within 60 days of testing, including information verifying Condition No. 5 above.
   (d) A verification based on actual emissions measurements that the main stack emissions do not cause a violation of the ambient air quality standards in Regulation I, Article 11, or cause incident levels above the ASILs listed in Regulation III, Appendix A.

FREDRICK L. AUSTIN P.E.
Reviewing Engineer

JAY M. WILLENBERG
Reviewing Engineer

for DENNIS J. McLERRAN
Air Pollution Control Officer

MEJ

Form 50-118. (1/93)

DATABASE INFORMATION

| | | | |
|---|---|---|---|
| **New NSPS due to this NOCOA?** | **No** | **Applicable NSPS:** | **Delegated?** |
| **New NESHAP due to this NOCOA?** | **No** | **Applicable NESHAP:** | **Delegated?** |
| **New Synthetic Minor due to this NOCOA?** | **No** | | |

Existing NESHAP: 40 CFR 63 Subpart LLL
Existing NSPS: 40 CFR 60 Subpart F & Y

**B. NOC FEES AND ANNUAL REGISTRATION FEES**

**NOC Fees:**

Fees have been assessed in accordance with the fee schedule in Regulation I, Section 6.04. All fees must be paid prior to issuance of the final Order of Approval.

| Fee Description | Cost | Amount Received (Date) |
|---|---|---|
| Filing Fee | $ 1,150 | |
| Modification of Existing Permit Conditions | $ 650 | |
| Filing received | | $ 1,150 (6/4/2020) |
| Additional fee received | | $ 650 |
| **Total** | **$1,750** | **$1,750** |

**Registration Fees**:
Registration fees are assessed to the facility on an annual basis. Fees are assessed in accordance with Regulation I, Section 7.07. No new changes due to this application.

20230004 - 11339.pdf

## C. STATE ENVIRONMENTAL POLICY ACT (SEPA) REVIEW

State Environmental Policy Act (SEPA) review was conducted in accordance with Regulation I, Article 2. The SEPA review is undertaken to identify and help government decision-makers, applicants, and the public to understand how a project will affect the environment. A review under SEPA is required for projects that are not categorically exempt in WAC 197-11-800 through WAC 197-11-890. A new source review action which requires a NOC application submittal to the Agency is not categorically exempt.

A new SEPA determination is not required because the potential impacts from this project were reviewed under SEPA by and a DNS was issued by PSCAA on 3/29/95 with NOC No. 5755. A copy of this DNS is included below and is being relied upon for this project.

NOC 05755
Reg #13359

# Puget Sound Air Pollution Control Agency

110 Union Street, Suite 500
Seattle, Washington 98101-2038

Telephone: (206) 343-8800
Facsimile: (206) 343-7522

## DETERMINATION OF NONSIGNIFICANCE

Description of proposal

**One AGC-Seattle Whole Tire Feed System for injecting whole tires as replacement fuel at the Coleiner level of the Preheater Tower above the Kiln, which is controlled by an existing Baghouse.**

Proponent

ASH GROVE CEMENT COMPANY (E MARG.)
3801 E MARGINAL WY S, SEATTLE, WA, 98134-1113

Owner

ASH GROVE CEMENT COMPANY (E MARG.)
3801 E MARGINAL WY S, SEATTLE, WA, 98134-1113

Location of proposal, including street address, if any

ASH GROVE CEMENT COMPANY (E MARG.), 3801 E MARGINAL WY S, SEATTLE, WA, 98134

Lead Agency

PUGET SOUND AIR POLLUTION CONTROL AGENCY

The lead agency for this proposal has determined that it does not have a probable significant adverse impact on the environment. An environmental impact statement (EIS) is not required under RCW 43.21C.030(2)(c). This decision was made after review of a completed environmental checklist and other information on file with the lead agency. This information is available to the public on request.

☐ There is no comment period for this DNS.

☐ This DNS is issued under 197-11-340(2); the lead agency will not act on this proposal for 15 days from the date below. Comments must be submitted by

Responsible Official: **Dennis J. McLerran**

Position/Title: **Air Pollution Control Officer**

Address: **110 Union Street, Suite 500, Seattle, Washington 98101-2038**

Date: 3/29/95 Signature: David D. Kunio

Form 69-175, (1/89)

## D. BEST AVAILABLE CONTROL TECHNOLOGY (BACT) REVIEW

### Best Available Control Technology (BACT)

New stationary sources of air pollution are required to use BACT to control all pollutants not previously emitted, or those for which emissions would increase as a result of the new source or modification. BACT is defined in WAC 173-400-030 as, "an emission limitation based on the maximum degree of reduction for each air pollutant subject to regulation under Chapter 70.94 RCW emitted from or which results from any new or modified stationary source, which the permitting authority, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes and available methods, systems, and techniques, including fuel cleaning, clean fuels, or treatment or innovative fuel combustion techniques for control of each pollutant."

An emissions standard or emissions limitation means "a requirement established under the Federal Clean Air Act or Chapter 70.94 RCW which limits the quantity, rate, or concentration of emissions of air contaminants on a continuous basis, including any requirement relating to the operation or maintenance of a source to assure continuous emission reduction and any design, equipment, work practice, or operational standard adopted under the Federal Clean Air Act or Chapter 70.94 RCW."

### Best Available Control Technology for Toxics (tBACT)

New or modified sources are required to use tBACT for emissions control for TAP. Best available control technology for toxics (tBACT) is defined in WAC 173-460-020 as, "the term defined in WAC 173-400-030, as applied to TAP."

The EPA has encouraged the use of tire derived fuel, as noted in the April 2005 document EPA530-F-05-006 as long as the facility: (1) have a tire storage and handling plan; (2)have secured a permit for all applicable and state and federal environmental programs; and (3) are in compliance with all the requirements of that permit. It does not state an upper limit. The EPA also released a Fact Sheet on Non-Hazardous Secondary Materials Determinations and Scrap Tires, found here: https://www.epa.gov/sites/default/files/2020-12/documents/scrap_tire_fact_sheet_dec_2020_v2.pdf. This Fact Sheet cites that for tires to remain non-waste, they must follow 40 CFR section 241.3(d)(1).

A Fact Sheet released by the Portland Cement Association, found here: https://archive.epa.gov/epawaste/conserve/materials/tires/web/pdf/brochure5-08.pdf, noted that notes that dioxin-furan emissions from kilns firing TDF were approximately a third of non TDF-firing kilns. PM emissions were also noted to go down by 35%. It also noted that there was no statistically significant difference between kilns firing TDF and non-TDF firing kilns in emissions of sulfur dioxide, nitrogen oxides, total hydrocarbons, carbon monoxide and metals.

Similar Permits

Ash Grove is the only cement kiln in the PSCAA jurisdiction. However, Ash Grove does have various locations around the country that do use tires as fuel.

Other Regulatory Agencies BACT for Ash Grove Cement Plants

**01-0029-TV-01 Oregon DEQ**
This facility is not allowed to burn any solid waste but is allowed to fire tires. There is no upper limit by weight, however, this permit has the following applicable conditions:

*43. Applicable Requirement: The permittee shall not heat the kiln, in whole or in part, by combusting solid waste (as the term is defined in 40 CFR 241). Secondary materials used in the kiln shall not be deemed to be combusted unless they are introduced into the flame zone in the hot end of the kiln or mixed with the precalciner fuel. [40 CFR 60.2875 – definition of "waste-burning kiln"] Waste tires are not considered a solid waste.*

*44. Monitoring Requirement: The permittee must maintain records of any non-hazardous secondary materials that are combusted in order to heat the kiln and that have been determined not to be solid waste pursuant to 40 CFR 241.3(b)(1). These records must document how the secondary material meets each of the legitimacy criteria under 40 CFR 241.3(d)(1). If the permittee combusts a fuel that has been processed from a discarded non-hazardous secondary material pursuant to 40 CFR 241.3(b)(4), records must be maintained as to how the operations that produced the fuel satisfy the definition of processing in 40 CFR 241.2 and each of the legitimacy criteria in 40 CFR 241.3(d)(1). If the fuel received a non-waste determination pursuant to the petition process submitted under 40 CFR 241.3(c), records must be maintained that document how the fuel satisfies the requirements of the petition process. If the permittee combusts non-hazardous secondary material as fuel per 40 CFR 241.4, records must be maintained documenting that the material is a listed non-waste under 40 CFR 241.4(a). [40 CFR 63.2740(u)]*

**2300015004 Utah DEQ**
This permit has the following conditions for tire derived fuel below:

Condition: Permittee shall meet the following requirements when used oil or tire derived fuel (TDF) is burned in the rotary kiln: i. Combustion gas temperature at the rotary kiln exit shall not drop below 1500 degrees Fahrenheit for more than five minutes in any 60-minute period. ii. Oxygen content at the kiln system ID fan shall not drop below 2% for more than five minutes in any 60-minute period. [Origin: DAQE-AN103030029-19]. [R307-401-8]

Monitoring: The permittee shall continuously monitor the temperature and oxygen content at all times used oil or TDF is burned in the kiln using equipment approved by the Director. Calibration procedure and frequency shall be according to manufacturer's specifications. Use of factory calibrated thermocouples for temperature measurement is approved. All monitoring equipment for both temperature and oxygen shall be located such that an inspector can safely read the output at any time. Additionally, the permittee shall monitor the quantities and times that used oil or TDF is burned in kiln.

Recordkeeping: Permittee shall record the temperature and oxygen content at no less than every 5 minutes during operations when used oil or TDF is burned in the kiln. The permittee shall record the quantities and times when used oil or TDF is burned in the kiln. Records shall be maintained in accordance with Provision I.S.1 of this permit.

Condition II.B.4.b also limits TDF to not exceed 15% of the combined energy input to the rotary kiln and pre-calciner.

Analysis

Ash Grove is currently allowed to burn TDF up to 30% of their total fuel by weight on a daily average. This permit action would remove that limit, which should not increase emissions at all. Ash Grove has several facilities, and they handle tire burning in a few different ways.

The first way is to register the facility for burning hazardous materials, which was the case in Arkansas and Kansas. The Seattle facility is avoiding this option, which is unnecessary as long as the TDF can be tracked as a non-hazardous secondary material and fuel source.

Out of all the locations, the Oregon facility offers the best parallel. The first applicable condition restricts the entire kiln from being heated with just tires. This is applicable in this situation because the kiln in Seattle is not designed to be entirely operated on tire derived fuel (TDF) and would require a modification. Tires are currently injected at the calciner level of the preheater tower above the kiln. Based on the location, it would be a mischaracterization to state the process could be entirely operated on TDF without a modification. This permit does not authorize modifications to the existing tire feed system, but rather allows the current tire feed system to be utilized up to its physical capabilities.

The second condition is keeping a fuel management plan. This is also currently required by the Seattle location.

A copy of all documents cited above are saved in the project folder.

Recommendations

- Kiln cannot be 100% operated on TDF
- Implement fuel management and usage plan

## E. EMISSION ESTIMATES

### Proposed Project Emissions

Actual Emissions

This change in operation should not increase actual emissions. Ash Grove did a short study increasing their hourly average while maintaining their daily average below 30%. The data is saved in the file folder and the results are shown below:

| | CO ppmc | CO lb/hr | $NO_X$ ppmc | $NO_X$ lb/hr | $SO_2$ ppmc | $SO_2$ lb/hr | TDF tn/hr | TDF weight % |
|---|---|---|---|---|---|---|---|---|
| Normal Average 9/20 & 9/22 | 763.4 | 397.5 | 434.5 | 369.0 | 30.7 | 36.8 | 2.1 | 26% |
| TDF Trial 9/21 Hr 10-13 | 758.0 | 395.5 | 389.8 | 334.0 | 30.5 | 36.4 | 3.1 | 37% |

This matches the EPA and Portland Cement Association's study that TDF does not significantly change emissions.

Potential Emissions

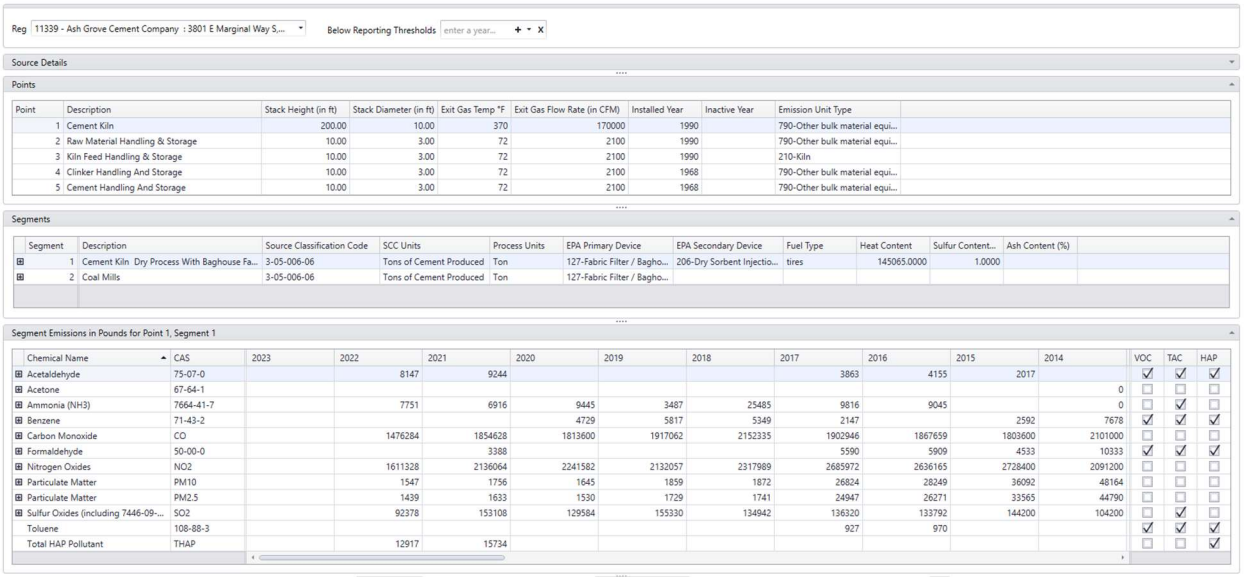
This facility is subject to limits in 40 CFR 60 Part F, 40 CFR 60 Part Y and 40 CFR 63 Part LLL. Those limits are summarized below:

| Pollutant | Limits |
|---|---|
| PM | • 20% Opacity<br>• 46 tons per year<br>• 0.30 lb/ton clinker<br>• 0.07 lb/ton clinker |
| CO | • 1045 ppm @ 10%$O_2$ 8-hr average<br>• 538 lbs/hr – 8 hr average<br>• 2353 tons per year |
| NOx | • 650 ppm @ 10% $O_2$ 24-hr average<br>• 1846 tons as a 12-month running total |
| $SO_2$ | • 180 ppm @ 10% $O_2$,1-hr average<br>• 176 tons per year |
| THC/OHAP | • 24 ppmvd or 12 ppmvd (MACT) |
| HCl | • 100 ppm @ 7% $O_2$ 1-hour average |
| D/F | • 0.20 ng/dscm @ 7% $O_2$ (MACT) or 0.4 ng/dscm @ 7% $O_2$ |

The criteria pollutants are measured with CEMS or CPMS. Removing the tire derived fuel usage limit, Condition No. 5 of Order of Approval No. 5755, would not pose any new risk of exceeding these limits. Dioxin/furan emissions are measured by periodic stack test.

**Facility-wide Emissions**

Actual Emissions



Reg 11339 - Ash Grove Cement Company : 3801 E Marginal Way S,... Below Reporting Thresholds enter a year...

Source Details

Points

| Point | Description | Stack Height (in ft) | Stack Diameter (in ft) | Exit Gas Temp °F | Exit Gas Flow Rate (in CFM) | Installed Year | Inactive Year | Emission Unit Type |
|---|---|---|---|---|---|---|---|---|
| 1 | Cement Kiln | 200.00 | 10.00 | 370 | 170000 | 1990 | | 790-Other bulk material equi... |
| 2 | Raw Material Handling & Storage | 10.00 | 3.00 | 72 | 2100 | 1990 | | 790-Other bulk material equi... |
| 3 | Kiln Feed Handling & Storage | 10.00 | 3.00 | 72 | 2100 | 1990 | | 210-Kiln |
| 4 | Clinker Handling And Storage | 10.00 | 3.00 | 72 | 2100 | 1968 | | 790-Other bulk material equi... |
| 5 | Cement Handling And Storage | 10.00 | 3.00 | 72 | 2100 | 1968 | | 790-Other bulk material equi... |

Segments

| Segment | Description | Source Classification Code | SCC Units | Process Units | EPA Primary Device | EPA Secondary Device | Fuel Type | Heat Content | Sulfur Content... | Ash Content (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Cement Kiln Dry Process With Baghouse Fa... | 3-05-006-06 | Tons of Cement Produced | Ton | 127-Fabric Filter / Bagho... | 206-Dry Sorbent Injectio... | tires | 145065.0000 | 1.0000 | |
| 2 | Coal Mills | 3-05-006-06 | Tons of Cement Produced | Ton | 127-Fabric Filter / Bagho... | | | | | |

Segment Emissions in Pounds for Point 1, Segment 1

| Chemical Name | CAS | 2023 | 2022 | 2021 | 2020 | 2019 | 2018 | 2017 | 2016 | 2015 | 2014 | VOC | TAC | HAP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acetaldehyde | 75-07-0 | | 8147 | 9244 | | | | 3863 | 4155 | 2017 | | ☑ | ☑ | ☑ |
| Acetone | 67-64-1 | | | | | | | | | | 0 | ☐ | ☐ | ☐ |
| Ammonia (NH3) | 7664-41-7 | | 7751 | 6916 | 9445 | 3487 | 25485 | 9816 | 9045 | | 0 | ☐ | ☑ | ☐ |
| Benzene | 71-43-2 | | | | 4729 | 5817 | 5349 | 2147 | | 2592 | 7678 | ☑ | ☑ | ☑ |
| Carbon Monoxide | CO | | 1476284 | 1854628 | 1813600 | 1917062 | 2152335 | 1902946 | 1867659 | 1803600 | 2101000 | ☐ | ☐ | ☐ |
| Formaldehyde | 50-00-0 | | | 3388 | | | | 5590 | 5909 | 4533 | 10333 | ☑ | ☑ | ☑ |
| Nitrogen Oxides | NO2 | | 1611328 | 2136064 | 2241582 | 2132057 | 2317989 | 2685972 | 2636165 | 2728400 | 2091200 | ☐ | ☐ | ☐ |
| Particulate Matter | PM10 | | 1547 | 1756 | 1645 | 1859 | 1872 | 26824 | 28249 | 36092 | 48164 | ☐ | ☐ | ☐ |
| Particulate Matter | PM2.5 | | 1439 | 1633 | 1530 | 1729 | 1741 | 24947 | 26271 | 33565 | 44790 | ☐ | ☐ | ☐ |
| Sulfur Oxides (including 7446-09-... | SO2 | | 92378 | 153108 | 129584 | 155330 | 134942 | 136320 | 133792 | 144200 | 104200 | ☐ | ☑ | ☐ |
| Toluene | 108-88-3 | | | | | | | 927 | 970 | | | ☑ | ☑ | ☑ |
| Total HAP Pollutant | THAP | | 12917 | 15734 | | | | | | | | ☐ | ☐ | ☑ |

Potential Emissions

See limits above

**F. OPERATING PERMIT OR PSD**

The Title V Air Operating Permit (AOP) program applicability for the entire source has been reviewed.

The facility is a Title V "**air operating permit source**" and conditions of this Order will be incorporated into the AOP during the next AOP opening.
Emission increases associated with this project were reviewed for Prevention of Significant Deterioration (PSD) Program applicability. The facility is an existing PSD major source, this project is not expected to increase the tons per year of emissions of any pollutant; therefore, any change in emissions from this permitting action is below PSD thresholds.

**G. AMBIENT TOXICS IMPACT ANALYSIS**

Like criteria pollutants, removing the daily limit for tire derived fuel should not increase any known TAP.

**H. APPLICABLE RULES & REGULATIONS**
**Puget Sound Clean Air Agency Regulations**

***SECTION 5.09 (b):*** The owner or operator of a registered source shall develop and implement an operation and maintenance plan to ensure continuous compliance with Regulations I, II, and III. A copy of the plan shall be filed with the Control Officer upon request. The plan shall reflect good industrial practice and shall include, but not be limited to, the following:
(1) Periodic inspection of all equipment and control equipment;

(2) Monitoring and recording of equipment and control equipment performance;
(3) Prompt repair of any defective equipment or control equipment;
(4) Procedures for startup, shut down, and normal operation;
(5) The control measures to be employed to ensure compliance with Section 9.15 of this regulation; and
(6) A record of all actions required by the plan.
The plan shall be reviewed by the source owner or operator at least annually and updated to reflect any changes in good industrial practice.

***SECTION 6.09***: Within 30 days of completion of the installation or modification of a stationary source subject to the provisions of Article 6 of this regulation, the owner or operator or applicant shall file a Notice of Completion with the Agency. Each Notice of Completion shall be submitted on a form provided by the Agency, and shall specify the date upon which operation of the stationary source has commenced or will commence.

***SECTION 9.03***: (a) It shall be unlawful for any person to cause or allow the emission of any air contaminant for a period or periods aggregating more than 3 minutes in any 1 hour, which is:
(1) Darker in shade than that designated as No. 1 (20% density) on the Ringelmann Chart, as published by the United States Bureau of Mines; or
(2) Of such opacity as to obscure an observer's view to a degree equal to or greater than does smoke described in Section 9.03(a)(1).
(b) The density or opacity of an air contaminant shall be measured at the point of its emission, except when the point of emission cannot be readily observed, it may be measured at an observable point of the plume nearest the point of emission.
(c) This section shall not apply when the presence of uncombined water is the only reason for the failure of the emission to meet the requirements of this section.

***SECTION 9.09***: General Particulate Matter (PM) Standard. It shall be unlawful for any person to cause or allow the emission of particulate matter in excess of the following concentrations:
Equipment Used in a Manufacturing Process: 0.05 gr/dscf @7% $O_2$

***SECTION 9.11***: It shall be unlawful for any person to cause or allow the emission of any air contaminant in sufficient quantities and of such characteristics and duration as is, or is likely to be, injurious to human health, plant or animal life, or property, or which unreasonably interferes with enjoyment of life and property.

***SECTION 9.13***: It shall be unlawful for any person to cause or allow the installation or use of any device or use of any means designed to mask the emission of an air contaminant which causes detriment to health, safety or welfare of any person.

***SECTION 9.15***: It shall be unlawful for any person to cause or allow visible emissions of fugitive dust unless reasonable precautions are employed to minimize the emissions. Reasonable precautions include, but are not limited to, the following:
(1) The use of control equipment, enclosures, and wet (or chemical) suppression techniques, as practical, and curtailment during high winds;
(2) Surfacing roadways and parking areas with asphalt, concrete, or gravel;

(3) Treating temporary, low-traffic areas (e.g., construction sites) with water or chemical stabilizers, reducing vehicle speeds, constructing pavement or rip rap exit aprons, and cleaning vehicle undercarriages before they exit to prevent the track-out of mud or dirt onto paved public roadways; or
(4) Covering or wetting truck loads or allowing adequate freeboard to prevent the escape of dust-bearing materials.

***SECTION 9.16(c)***: General Requirements for Indoor Spray-Coating Operations. It shall be unlawful for any person subject to the provisions of this section to cause or allow spray-coating inside a structure, or spray-coating of any motor vehicles or motor vehicle components, unless all of the following requirements are met:
(1) Spray-coating is conducted inside an enclosed spray area;
(2) The enclosed spray area employs either properly seated paint arresters, or water-wash curtains with a continuous water curtain to control the overspray; and
(3) All emissions from the spray-coating operation are vented to the atmosphere through an unobstructed vertical exhaust vent.

***REGULATION I, SECTION 9.20(a)***: It shall be unlawful for any person to cause or allow the operation of any features, machines or devices constituting parts of or called for by plans, specifications, or other information submitted pursuant to Article 6 of Regulation I unless such features, machines or devices are maintained in good working order.

**Washington State Administrative Code**

WAC 173-400-040(3): Fallout. No person shall cause or allow the emission of particulate matter from any source to be deposited beyond the property under direct control of the owner or operator of the source in sufficient quantity to interfere unreasonably with the use and enjoyment of the property upon which the material is deposited.

WAC 173-400-040(4): Fugitive emissions. The owner or operator of any emissions unit engaging in materials handling, construction, demolition or other operation which is a source of fugitive emission:

(a) If located in an attainment area and not impacting any nonattainment area, shall take reasonable precautions to prevent the release of air contaminants from the operation.

WAC173-400-111(7): Construction limitations.

(a) Approval to construct or modify a stationary source becomes invalid if construction is not commenced within eighteen months after receipt of the approval, if construction is discontinued for a period of eighteen months or more, or if construction is not completed within a reasonable time. The permitting authority may extend the eighteen-month period upon a satisfactory showing by the permittee that an extension is justified.

**Federal**

40 CFR 60.50a(c): Any unit combusting a single-item waste stream of tires is not subject to this subpart if the owner or operator of the unit:
(1) Notifies the Administrator of an exemption claim; and
(2) Provides data documenting that the unit qualifies for this exemption.

Part 40 CFR *241SOLID WASTES USED AS FUELS OR INGREDIENTS IN COMBUSTION UNITS*
40 CFR 241.4(a): The following non-hazardous secondary materials are not solid wastes when used as a fuel in a combustion unit:
(1)Scrap tires that are not discarded and are managed under the oversight of established tire collection programs, including tires removed from vehicles and off-specification tires.

## I. PUBLIC NOTICE

This project does not meet the criteria for mandatory public notice under WAC 173-400-171(3). Criteria requiring public notice includes, but is not limited to, a project that exceeds emission threshold rates as defined in WAC 173-400-030 (e.g. 40 tpy NOx, VOC, or $SO_2$, 100 tpy CO, 15 tpy $PM_{10}$, 10 tpy $PM_{2.5}$, 0.6 tpy lead), includes a WAC 173-400-091 synthetic minor limit, has a toxic air pollutant emission increase above the acceptable source impact level in WAC 173-460-150, or has significant public interest. A notice of application was posted on the Agency's website for 15 days. No requests or responses were received. A copy of the website posting is below:

**New Construction Projects**

| Company | Address | Project Description | Date Posted | Contact Engineer |
|---|---|---|---|---|
| Ash Grove Cement Company | 3801 E Marginal Way S, Seattle, WA 98134 | Increase percentage of fuel that can be whole tires. | 6/4/24 | Carl Slimp |

## J. RECOMMENDED APPROVAL CONDITIONS

**Standard Conditions:**

1. Approval is hereby granted as provided in Article 6 of Regulation I of the Puget Sound Clean Air Agency to the applicant to install or establish the equipment, device or process described hereon at the installation address in accordance with the plans and specifications on file in the Engineering Division of the Puget Sound Clean Air Agency.

2. This approval does not relieve the applicant or owner of any requirement of any other governmental agency.

**Specific Conditions:**

3. Ash Grove shall measure and record, each calendar day, the total weight of whole tires injected as non-hazardous secondary material fuel as defined by 40 CFR 241.4(a)(1).

4. Ash Grove shall submit a Fuel Monitoring Plan for injection of whole tires within 60 days after this approval. The plan shall contain the method for complying with condition 3, the replacement fuel composition (i.e., Btu content, percent ash, etc.), and the maximum rate of whole tires that will be used. The rate established in this submitted plan will become the new allowable maximum TDF firing percentage to replace the previously established 30% by weight, daily average, limit authorized by NOC 5755.

5. Ash Grove shall submit an Emission Monitoring Plan within 60 days after this approval. The plan shall contain the following elements:
   a. Measurement methods, analytical procedure and testing dates for demonstrating compliance with the requirements of 40 CFR 63.1343(b)(1).
   b. The measurement methods shall include a combination of Continuous Emission Rate Monitoring Systems, Continuous Emission Monitoring Systems and source tests to show compliance with 40 CFR 60 subpart F and 40 CFR 63 Subpart LLL.

6. Within 60 days after the submittal of the updated fuel monitoring plan, Ash Grove shall conduct source tests to demonstrate compliance with the following previously established emission limits:
   a. Kiln exhaust shall not exceed 0.30 lb of particulate per ton of feed (dry basis) except during SSM periods
   b. Ash Grove shall not cause to be discharged into the atmosphere from the kiln exhaust Dioxin/Furan (D/F) exceeding 0.20 ng/dscm (TEQ) @ 7% O2. If the average temperature at the inlet to the baghouse during the D/F performance test is 400°F or less, this limit is changed to 0.40 ng/dscm (TEQ).

   Ash Grove shall conduct the tests at the maximum rate of whole tire injection specified in condition 4. These source tests shall use EPA Method 5 or EPA method 201 A (particulate) and EPA method 23 (dioxins/ furans). Ash Grove shall submit a report of the test results within 60 days of testing.

7. Ash Grove shall report any deviation from the fuel monitoring plan that represent a potential threat to human health or safety as soon as possible but no later than 12 hours after such a deviation is discovered. Ash Grove shall report other deviations in writing to Puget Sound Clean Air Agency Operating Permit Certification no later than 30 days after the end of the month during which the deviation is discovered.

8. This order of approval supersedes and cancels Order of Approval No. 5755, dated March 30, 1995.

## K. CORRESPONDENCE AND SUPPORTING DOCUMENTS

5755.pdf

Portland Cement Association Sustainable Manufacturing Fact Sheet

May 2008

Concrete Thinking for a sustainable world

PCA Portland Cement Association

# TIRE-DERIVED FUEL

Scrap tires, if not properly managed, can create an environmental nuisance and eyesore. What's more, they can constitute an environmental hazard if they burn in an uncontrolled manner, such as in a field or landfill.

However, by utilizing cement kilns' controlled combustion environment, scrap tires can be an environmentally-sound source of energy in the manufacture of cement.

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continued

Like fossil fuels such as coal, oil, and natural gas, tires contain hydrocarbons. Pound for pound, tires have more fuel value than coal. Hundreds of millions of used tires are generated annually in the United States. By simply disposing of these tires, we miss an important recycling opportunity: the chance to recover their energy and conserve our resources of fossil fuels.

Cement making is an ideal process for recovering this energy. The intense heat of the kiln ensures complete destruction of the tires. There is no smoke or visible emissions from the tires. In fact, the use of tires as fuel can actually reduce certain emissions.

### An Alternative to Traditional Fossil Fuels

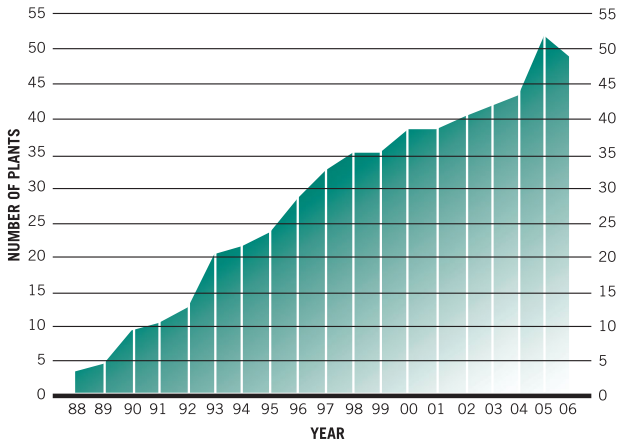
The Rubber Manufacturers Association (RMA) has estimated that 58 million scrap tires were used as fuel in portland cement plants in 2005 out of the 299 million tires produced that year [RMA 2006]. The United States Environmental Protection Agency (USEPA) states that tire-derived fuel (TDF) contains about the same amount of energy as oil and 25% more energy than coal [USEPA 2007b]. This means that each ton of TDF used by a portland cement plant has the potential to replace 1.25 tons of coal, and the impacts of coal mining, processing, and transporting are avoided. In energy terms, the cement industry consumed 12.6 trillion BTUs of TDF in 2006 which is approximately 3.6% of all of the non-electrical energy required by the manufacturing process [PCA 2007a].

### TDF Use Is Increasing

The number of cement plants utilizing scrap tires as a supplemental fuel has risen dramatically over the last 19 years. Figure 1 shows the increase in portland cement plants utilizing TDF [PCA 1995, 2002, and 2007a]. As of 2006, state and local environmental agencies have approved the use of TDF at 48 plants in 21 states (Table 1).

FIGURE 1

**U.S. Portland Cement Plants Utilizing Tire-Derived Fuel** [PCA 1995, 2002, and 2007a]

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Durkee, OR
Foreman, AR
Inkom, ID
Midlothian, TX
Nephi, UT
Seattle, WA

**Buzzi Unicem USA, Inc.**
Cape Girardeau, MO
Oglesby, IL
Pryor, OK
Sweetwater, TX

**California Portland Cement Co.**
Colton, CA

**Capitol Aggregates, Inc.**
San Antonio, TX

**CEMEX**
Brooksville, FL (South)
Brooksville, FL (North)
Clinchfield, GA
Demopolis, AL
Knoxville, TN
New Braunfels, TX
Odessa, TX
Victorville, CA

**ESSROC Cement Corp.**
Bessemer, PA
Frederick, MD

**Florida Rock Industries, Inc.**
Newberry, FL

**Holcim (US) Inc.**
Ada, OK
Clarksville, MO
Dundee, MI
Florence, CO
Hagerstown, MD
Mason City, IA
Midlothian, TX
Morgan, UT
Theodore, AL

**Lafarge North America Inc.**
Calera, AL
Grand Chain, IL
Harleyville, SC
Tulsa, OK
Whitehall, PA

**Lehigh Cement Company**
Fleetwood, PA
Leeds, AL
Redding, CA

**Mitsubishi Cement Corp.**
Lucerne Valley, CA

**Monarch Cement Company**
Humboldt, KS

**National Cement Company**
Lebec, CA
Ragland, AL

**Texas Industries, Inc.**
New Braunfels, TX
Oro Grande, CA

**Texas-Lehigh Cement Company**
Buda, TX

### THE CEMENT-MAKING PROCESS

Portland cement manufacturing is a four-step process:

1. Raw materials, including limestone and small amounts of sand and clay, come from quarries usually located near the cement manufacturing plant. Limestone is typically about 80% of the raw mix and is the source of calcium. The remaining raw materials provide the silica and the necessary small amounts of alumina and iron.
2. The materials are carefully analyzed, precisely combined and blended, and then ground for further processing.
3. The ground materials are heated in an industrial furnace, called a kiln; kilns are a rotating vessel ranging in length from 60 to over 200 meters (200 to >650 feet) long with a diameter ranging from 3 to 7.5 meters (10 to 25 feet). The kiln reaches temperatures of 1,450° C (2,650° F). The heat causes the materials to turn into a new marble-sized substance called clinker. The kiln flame is fueled by powdered coal, powdered petroleum coke, natural gas, oil, and/or recycled materials burned for energy recovery.
4. Red-hot clinker is cooled and ground with a small amount of gypsum. The end-result is a fine powder called portland cement. At each stage, process data are continuously monitored to produce a high-quality product, improve energy efficiency, and minimize emissions.

### CEMENT OR CONCRETE?

The terms cement and concrete are often misused. Cement is an ingredient of concrete. It is the fine powder that, when mixed with water, sand, and gravel or crushed stone, forms the rock-like mass known as concrete. Cement acts as the binding agent or glue in concrete.

Additional U.S. plants have expressed interest in obtaining a permit or have received a permit but have not begun utilizing scrap tires as a fuel. The delay in utilizing TDF may be due to equipment limitations at the cement plant, regional TDF availability, state regulatory agency review, and local community discussions. Figure 2 shows the locations of all of the facilities currently utilizing in TDF.

**Beneficial Effects**

The environmental benefits of utilizing scrap tires as a supplemental fuel in the portland cement manufacturing process are multifold. When whole tires are combusted in cement kilns, the steel belting becomes a component of the clinker, replacing some or all of the iron required by the manufacturing process.

In 2008, PCA member companies completed a study on the impact of TDF firing on cement kiln air emissions. The study's data set included emission tests from 31 of the cement plants presently firing TDF. Dioxin-furan emission test results indicated that kilns firing TDF had emissions approximately one-third of those kilns firing conventional fuels – this difference was statistically significant. Emissions of particulate matter (PM) from TDF-firing kilns were 35% less than the levels reported for kilns firing conventional fuels (not statistically significant due to the low PM emissions reported for essentially all cement plants). Nitrogen oxides, most metals, and sulfur dioxide emissions from TDF-firing kilns also exhibited lower levels than those from conventional fuel kilns. The emission values for carbon monoxide and total hydrocarbons were slightly higher in TDF versus non-TDF firing kilns.

However, none of the differences in the emission data sets between TDF versus non-TDF firing kilns for sulfur dioxide, nitrogen oxides, total hydrocarbons, carbon monoxide, and metals were statistically significant. Separate studies conducted by governmental agencies and engineering consulting firms have also indicated that TDF firing either reduces or does not significantly affect emissions of various contaminants from cement kilns [PCA 2008].

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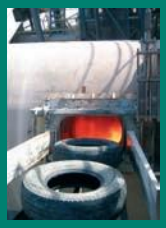

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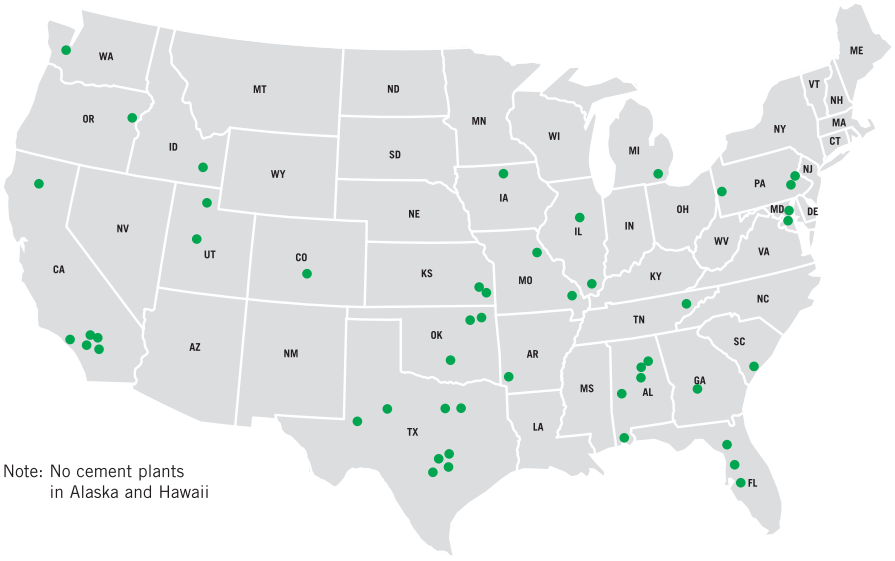
**FIGURE 2**

**U.S. Portland Cement Plants Currently Utilizing Tire-Derived Fuel**




Note: No cement plants in Alaska and Hawaii

● Portland cement plants currently permitted and utilizing tire-derived fuels (48 plants)

**FOR ADDITIONAL INFORMATION REGARDING THIS SUBJECT, PLEASE CONTACT:**

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Portland Cement Association
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Fax: 202.408.0877
Email: twilson@cement.org



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Under their program for the voluntary reporting of greenhouse gases, the United States Department of Energy (USDOE) has estimated that the combustion of TDF produces less carbon dioxide ($CO_2$) per unit of energy than coal [USDOE 2007a]. This means that when TDF replaces coal in a portland cement kiln—for example, when scrap tires are used to heat the precalciner vessel instead of coal—less $CO_2$ will be produced. The Mojave Desert Air Quality Management District in California has determined that TDF use is NOx RACT ("Reasonably Available Control Technology") for portland cement kilns [CARB, 2002].

The use of TDF is common in other parts of the world. In Japan, there were 103 million scrap tires generated in 2006 with 16% being used as a fuel in the cement industry. For that year Japan recycled 54% of all scrap tires through heat utilization [JATMA 2007]. Of the approximately 3.2 million metric tons of scrap tires handled annually in Europe, 31.6% are directed to energy recovery systems including portland cement kilns [ETRMA 2007].

## References

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*Instructions for Form EIA-1605, Voluntary Reporting of Greenhouse Gases*, Energy Information Administration, United States Department of Energy, Washington, DC, USA, October 2007a.

*Management of Scrap Tires – Tired Derived Fuel*, United States Environmental Protection Agency, Washington, DC, USA, September 7, 2007b. http://www.epa.gov/epaoswer/non-hw/muncpl/tires/tdf.htm

"Rule 1161 – Portland Cement Kilns," (Adopted: 06/28/95; Amended: 10/22/01; Amended: 03/25/02), Mojave Desert Air Quality Management District, California Air Resources Board, Sacramento, CA, USA, 2002. http://www.arb.ca.gov/drdb/moj/curht-ml/r1161.pdf

*Tyre Industry of Japan 2007*, Japan Automobile Tyre Manufacturers Association, Inc., Tokyo, Japan, July 2007.

*U.S. and Canadian 1994 Labor-Energy Input Survey*, Portland Cement Association, Skokie, IL, USA, December 1995.

*U.S. and Canadian 2000 Labor-Energy Input Survey*, Portland Cement Association, Skokie, IL, USA, March 2002.

*U.S. and Canadian 2006 Labor-Energy Input Survey*, Portland Cement Association, Skokie, IL, USA, 2007a.

*U.S. and Canadian Portland Cement Industry: Plant Information Summary, December 31, 2006*, Portland Cement Association, Skokie, IL, USA, 2007b.

*U.S. Scrap Tire Markets 2005 Edition*, Rubber Manufacturers Association, Washington, DC, USA, November 2006.

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Portland Cement Association is a trade association representing cement companies in the United States and Canada. PCA's U.S. membership consists of 30 companies operating 115 plants in 36 states. PCA members account for more than 98 percent of cement-making capacity in the United States and 100 percent in Canada.

**Portland Cement Association**
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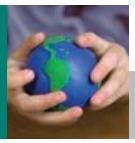



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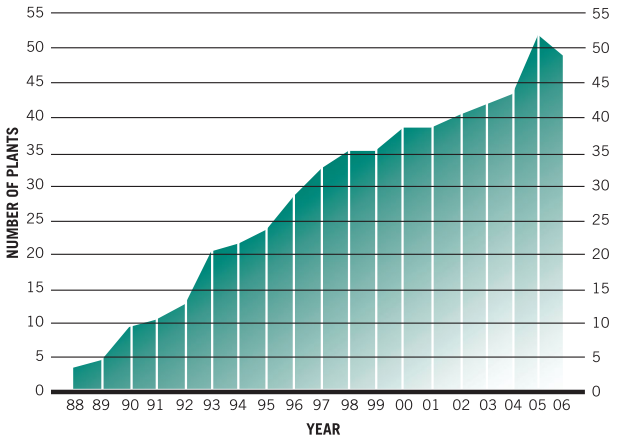


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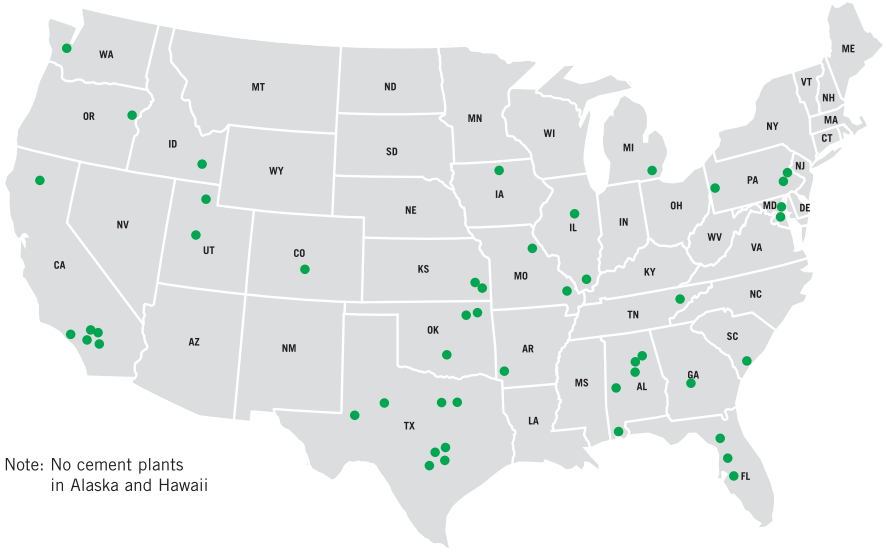


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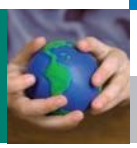



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*Tyre Industry of Japan 2007*, Japan Automobile Tyre Manufacturers Association, Inc., Tokyo, Japan, July 2007.

*U.S. and Canadian 1994 Labor-Energy Input Survey*, Portland Cement Association, Skokie, IL, USA, December 1995.

*U.S. and Canadian 2000 Labor-Energy Input Survey*, Portland Cement Association, Skokie, IL, USA, March 2002.

*U.S. and Canadian 2006 Labor-Energy Input Survey*, Portland Cement Association, Skokie, IL, USA, 2007a.

*U.S. and Canadian Portland Cement Industry: Plant Information Summary, December 31, 2006*, Portland Cement Association, Skokie, IL, USA, 2007b.

*U.S. Scrap Tire Markets 2005 Edition*, Rubber Manufacturers Association, Washington, DC, USA, November 2006.

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## L. REVIEWS

| Reviews | Name | Date |
|---|---|---|
| Engineer: | Carl Slimp | 4/16/2024 |
| Inspector: | Gerard Van der Jagt | 4/16/2024 |
| Second Review: | John Dawson | 6/21/2024 |
| Applicant Name: | Jeff Briggs | 11/8/2024 |