

Shand Fly Ash (CAS# 68131-74-8) – External Use Document

Safety Data Sheet

according to the Hazardous Products Regulation (February 11, 2015)

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Version: 3.0

SECTION 1: Identification

1.1. Product identifier

Product form : Mixture
Product name : Shand Fly Ash (CAS# 68131-74-8) – External Use Document
Other means of identification : Natural fly ash from Shand Power Station (SHPS), located near Estevan, Saskatchewan, Canada.

1.2. Recommended use and restrictions on use

Recommended uses and restrictions : This product is used primarily as a partial cement replacement in the production of redi-mix cement and the manufacture of products such as concrete blocks, pipe, and paving stone.

1.3. Supplier

Manufacturer (Head Office)
SaskPower (Saskatchewan Power Corporation)
2025 Victoria Avenue
S4P 0S1 Regina, SK - Canada
T Normal business hours only: Toll Free (Canada only) 1-800-667-8022 – SaskPower – Power Contracts

1.4. Emergency telephone number

Emergency number : IN CASE OF A DANGEROUS GOODS EMERGENCY call CANUTEC at 613-996-6666 (collect calls accepted). (This includes workplace emergencies.)

SECTION 2: Hazard identification

2.1. Classification of the substance or mixture

Classification (GHS-CA)

Skin Corrosion 1A (see Note 1)	H314
Eye Damage 1 (see Note 1)	H318
Carcinogen 1A (see Note 2)	H350
Specific Target Organ Toxicity Single Exposure 3	H335
Specific Target Organ Toxicity Repeated Exposure 1 (See Note 3)	H372

- Note 1: The skin and eye corrosion hazard classifications are based on the high (basic, alkaline) pH obtained in 20%, 10%, and 1% suspensions of fly ash in water. This may represent a very conservative approach to the classification of these hazards. No *in vitro* or *in vivo* data is available.
- Note 2: Fly ash, itself, is not a carcinogen. However, respirable crystalline silica in the form of quartz or cristobalite from occupational sources is listed by ACGIH, IARC, and NTP as a lung carcinogen or suspected carcinogen. There is limited evidence in experimental animals for the carcinogenicity of tridymite (IARC). The fly ash contains crystalline silica; however, the respirable portion of the crystalline silica has not been determined. The level of risk associated with crystalline silica which occurs along with (i.e., attached to, embedded in) other material in a fly ash particle is not well understood, but may be reduced compared to inhalation of particles composed of “pure” crystalline silica.
- Note 3: Prolonged exposure to respirable crystalline silica may cause silicosis, a lung disease, which may be disabling. The fly ash contains crystalline silica; however, the respirable portion of the crystalline silica has not been determined.

2.2. GHS Label elements, including precautionary statements

GHS-CA labelling

Hazard pictograms (GHS-CA) :



Signal word (GHS CA) : Danger

Hazard statements (GHS-CA) : H314 - Causes severe skin burns and eye damage.
H335 - May cause respiratory irritation.
H350 - May cause cancer.
H372 - Causes damage to organs through prolonged or repeated exposure.

Precautionary statements (GHS-CA) : P201 - Obtain special instructions before use.
P202 - Do not handle until all safety precautions have been read and understood.
P260 - Do not breathe dust.
P264 - Wash hands, forearms and face thoroughly after handling.
P270 - Do not eat, drink or smoke when using this product
P271 - Use only outdoors or in a well-ventilated area.
P280 - Wear protective gloves/protective clothing/eye protection/face protection.

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P301 + P330 + P331 + P315 - IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Get immediate medical advice/attention
P302 + P335 + P352 + P310 - IF ON SKIN: Brush off loose particles from skin. Wash with plenty of water. Obtain medical attention immediately if any signs of chemical or thermal burns are noted / suspected
P304 + P340 + P312 - IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTRE or doctor/physician if you feel unwell
P305 + P351 + P338 + P315 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. GET IMMEDIATE MEDICAL ADVICE/ATTENTION
P308+P313 - IF exposed or concerned: Get medical advice/attention.
P310 - Immediately call a POISON CENTER or doctor.
P363 - Wash contaminated clothing before reuse.
P401 + P402 - Store in a secure, dry location
P403+P233 - Store in a well-ventilated place. Keep container tightly closed.
P405 - Store locked up.
P501 - Dispose of contents/container to hazardous or special waste collection point, in accordance with local, regional, national and/or international regulation.

2.3. Other hazards

Other hazards not contributing to the classification

: Note that, to some extent, burns may be thermal as well as caustic due to the heat released by the reaction of ash components (e.g, available alkalinity, such as calcium oxide or calcium hydroxide) with moisture (e.g, eyes, mucus membranes, sweat).

Titanium dioxide is classified by IARC as a Group 2B carcinogen (possibly carcinogenic to humans). NIOSH considers ultrafine (respiratory particles with a primary particle diameter of < 100 nm) titanium dioxide as a potential occupational carcinogen, but considers there to be insufficient data to similarly classify fine titanium dioxide. Exposure to titanium dioxide dust may lead to other lung effects – e.g., fibrosis. The titanium content in fly ash is reported as TiO₂; this is the standard convention for the reporting of Ti content in fly ash: the actual occurrence of any discrete particles of TiO₂ in the fly ash is unknown.

Although it is a transient rather than inherent characteristic of the fly ash, note that fly ash withdrawn directly from an electrostatic precipitator (ESP) hopper, fly ash storage (sales) silo, or encountered elsewhere in – or recently exited from – other power plant process equipment may be very hot due to retained heat originating from the coal combustion process. **Consequent to the loading of hot fly ash from a silo, fly ash transport trailers may contain, transport, and subsequently deliver hot ash. Temperatures may be high enough to cause serious burns and to damage materials or equipment that come into contact with the ash. Additionally, the chemical reactivity of the hot fly ash – for example, the reaction of alkaline ash constituents with water – may be greatly enhanced** relative to that of the ash at ambient temperatures, potentially generating additional heat, even higher temperatures, and – in the case of contact with water – flashing some of the water to steam.

Note that the hot fly ash (whether recently exited from the process or held in storage (sales) silos) may have had almost no opportunity* for the surfaces of the lime (CaO) particles to have undergone any reaction with atmospheric humidity and / or carbon dioxide (CO₂). Thus, in addition to the increased rate of the CaO hydration reaction (due to the elevated ash temperature) – if the ash comes into contact with water – the lime particles may also have chemically unaltered surfaces, which may also make them more immediately reactive than their later cooled, “aged” state. (* In some cases, however, some of the fly ash may have had some contact with water via sprays in a downstream pollution-control process.).

NOTE that, the practice of injecting limestone into the boiler furnace at Shand has stopped since January of 2018, and therefore this product does no longer contain an **ENHANCED** level of **Available Lime** as previously. Available lime as Ca(OH)₂ (hydrated lime) for 6 samples collected in the month of April 2019 ranged from 0.3 - 0.8%.

On request, SaskPower Power Contracts will provide additional information by calling 1-800-667-8022 toll free (in Canada).

2.4. Unknown acute toxicity (GHS CA)

Not applicable

SECTION 3: Composition/information on ingredients

3.1. Substances

Not applicable

3.2. Mixtures

Name	Product identifier	%
Ashes, residues	(CAS-No.) 68131-74-8	100

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Name	Product identifier	%
Containing:		
Calcium oxide ¹	(CAS-No.) 1305-78-8	7 – 13 ¹
Sodium oxide (Na ₂ O)	(CAS-No.) 1313-59-3	3 – 7
Quartz ²	(CAS-No.) 14808-60-7	1 – 5 ²
Potassium oxide (K ₂ O)	(CAS-No.) 12136-45-7	1 – 5
Sulfur trioxide ³	(CAS-No.) 7446-11-9	0.5 – 5
Barium oxide	(CAS-No.) 1304-28-5	0.1 – 1
Silica, cristobalite ⁴	(CAS-No.) 14464-46-1	0.1 – 1 ³
Phosphorus oxide (P ₂ O ₅)	(CAS-No.) 1314-56-3	0.1 – 1
Tridymite ⁵	(CAS-No.) 15468-32-3	0.1 – 1 ⁴
Titanium dioxide ⁶	(CAS-No.) 13463-67-7	0.1 – 1 ⁵

Comments : The concentrations listed are typical; the fly ash results from the burning of lignite coal for electrical generation; compositional variation of the fly ash exists due to variations in the coal, itself, variations in the composition and amount of natural mineral material associated with the delivered coal (a function of the mining process) and consequently fed with the coal, and, to a lesser extent, the combustion conditions in the furnace.

Fly ash and other coal combustion products (CCPs) are UVCB substances (substances of unknown or variable composition or biological). Various CCPs, noted as Ashes; Ash; Ash residues; Ashes, residues, bottom; Bottom ash; Bottom ash residues; Waste solids, ashes under TSCA are defined by the US EPA as: "The residuum from the burning of a combination of carbonaceous materials. The follow elements may be present as oxides: aluminum, calcium, iron, magnesium, nickel, phosphorus, potassium, silicon, sulfur, titanium, and vanadium." Ashes including fly ash and fluidized bed combustion ash are identified by CAS number 68131-74-8. The exact composition of the ash is dependent on the fuel source and flue additives composed of a large number of constituents. The classification of the final substance is dependent on the presence of specific identified oxides as well as other trace elements.

¹ The 7 – 13 wt. % CaO indicated in the composition table is a reflection of the total calcium (Ca) content of the fly ash, expressed conventionally as the oxide. The actual forms in which the Ca occurs in the ash are not known. Some or most of the calcium present is believed to exist as a component in a complex chemical mixture of silicates and aluminosilicates; however, at least some portion of the calcium is probably present as "free" calcium oxide or calcium hydroxide. **The free or available calcium oxide (CaO)** in the Shand fly ash expressed as Ca(OH)₂ and estimated based on ASTM C-25 (modified) analysis showed a free or available calcium oxide (CaO) concentration of 0.3 -0.8%, expressed as Ca(OH)₂. Nevertheless, available lime contents both higher and lower than the recent results may be possible, depending on the original coal composition.

² Existing data (see below) indicates less than 10 wt. % crystalline silica as quartz present in the fly ash; it is believed that some or much of the crystalline silica content of the source coal is fluxed by the high alkaline constituent content of the ash and thereby converted to amorphous silicates (the amount converted to amorphous silica, if any, is unknown); however, due to variability in the mined coal and the combustion process and limitations in measurement, it is possible that the crystalline silica content of the fly ash may vary considerably.

Crystalline silica as quartz was reported as:

- i) 2.5 – 4.0 wt. % (lab 1, six 2019/04 samples)
- ii) 2.6 – 2.8 wt. % (lab 1, one 2013/12/08, 2013/12/23 composite sample and one 2013/12/13 sample)
- iii) 7.6 wt. % (lab 3, one 2013/12/08, 2013/12/23 composite sample)
- iv) 1.9 – 2.1 wt. % (lab 1, one 2010/11/01, 2010/11/05 composite sample and one 2010/12/01 sample)
- v) 5.7 – 7.7 wt. % (lab 2, one 2010/11/01, 2010/11/05 composite sample and one 2010/12/01 sample).

³ Sulphur, at a level of perhaps 1 to as high as 4 wt. % conventionally expressed as SO₃, has been typically also present in the fly ash when limestone was being injected into the furnace, although analyses of six samples in April 2019 with no limestone injection into the furnace ranged only from 0.5-2% as SO₃. Some of the sulphur may be incorporated into the complex silicate / aluminosilicate ash matrix while some may be present in discrete compounds. The sulphur that is present in discrete compounds is likely present primarily as a mixture of sulphate (SO₄²⁻, e.g., as calcium sulphate) and sulphite (SO₃²⁻, e.g., as calcium sulphite); the proportion of sulphate to sulphite is unknown - and is probably quite variable - and the sulphite is expected to be subject to oxidation to sulphate over time., at a level of perhaps 1 to as high as 4 wt. % conventionally expressed as SO₃, has been typically also present in the fly ash when limestone was being injected into the furnace, although analyses of six samples in April 2019 with no limestone injection into the furnace ranged only from 0.5-2% as SO₃. Some of the sulphur may be incorporated into the complex silicate / aluminosilicate ash matrix while some may be present in discrete compounds. The sulphur that is present in discrete compounds is likely present primarily as a mixture of sulphate (SO₄²⁻, e.g., as calcium sulphate) and sulphite (SO₃²⁻, e.g., as calcium sulphite); the proportion of sulphate to sulphite is unknown - and is probably quite variable - and the sulphite is expected to be subject to oxidation to sulphate over time.

⁴ The fly ash contains a small amount of crystalline silica in the form of cristobalite (CAS# 14464-46-1) (lab 3, one 2013/12/08, 2013/12/23 composite sample: α + β cristobalite: 2.4 wt. %; lab 2, one 2010/11/01, 2010/11/05 composite sample and one 2010/12/01 sample: cristobalite: not detected). Cristobalite was indicated to be present in all 6 samples collected in April 2019 to be in the range 0.13-0.64 %; although its presence was not confirmed by another lab in two of the samples.

⁵ The presence in the fly ash of crystalline silica in the form of tridymite (CAS# 15468-32-3) is somewhat uncertain; tridymite was reported by one lab on six 2019/04 samples as 0.25 – 0.74 wt. %; however, tridymite was not detected in a (lab 3) 2013/12/08, 2013/12/23 composite sample or (lab 2) one 2010/11/01, 2010/11/05 composite sample and one 2010/12/01 sample. Tridymite was indicated to be present in all 6 samples collected in April 2019 to be in the range 0.25-0.74 %.

⁶ Titanium (Ti) content in the ash is conventionally reported as the oxide; the actual form in which the Ti occurs in the ash is not known.

The coal ash originates as a result of the combustion of coal; that is, as a result of the high-temperature conversion (in the presence of air) of the mineral matter originally present in the coal – plus those elements which may be incorporated into, or associated with, the organic (carbon) structure of the coal – during the combustion process in the boiler furnace. Coal ash compositions (except for trace elements) are conventionally expressed as the oxides of the main chemical elements present (e.g., for silicon, aluminum, iron, calcium, magnesium, barium, strontium, sodium,

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potassium, phosphorus, titanium, manganese, and sulphur, where the silicon (Si) content is expressed as SiO₂, the aluminum (Al) content is expressed as Al₂O₃, etc.); however, for the most part – the major exception normally being a portion of the silicon dioxide (SiO₂) – the actual concentrations of the various ash elements as discrete or uncombined oxides is normally believed to be low (or in some cases, perhaps essentially "zero"); most⁽¹⁾ of the ash constituents are believed to exist as a complex mixture of silicates and aluminosilicates.

⁽¹⁾ However, for example, some free or available CaO – or Ca(OH)₂ – and iron oxides (e.g., Fe₂O₃, Fe₃O₄) may also be present; available lime concentrations, expressed as Ca(OH)₂, of six samples in April 2019 ranging from 0.3 % - 0.8% respectively; the available lime concentrations, expressed as Ca(OH)₂ of two samples – a 2013/12/08, 2013/12/23 composite and a 2013/12/13 sample – were 5.0 and 4.5 wt. %, respectively; the available lime concentration, expressed as Ca(OH)₂, of a 2010/11/01, 2010/11/05 composite sample was 8.9 wt. %; that of a 2010/12/01 sample was only 1.2 wt. %. Sulphur, at a level of perhaps 1 to as high as 4 wt. % conventionally expressed as SO₃, has been typically also present in the fly ash when limestone was being injected into the furnace, although analyses of six samples in April 2019 with no limestone injection into the furnace ranged only from 0.5-2% as SO₃. Some of the sulphur may be incorporated into the complex silicate / aluminosilicate ash matrix while some may be present in discrete compounds. The sulphur that is present in discrete compounds is likely present primarily as a mixture of sulphate (SO₄²⁻, e.g., as calcium sulphate) and sulphite (SO₃²⁻, e.g., as calcium sulphite); the proportion of sulphate to sulphite is unknown – and is probably quite variable – and the sulphite is expected to be subject to oxidation to sulphate over time.

The composition of the fly ash is subject to variation, depending especially on the characteristics of the coal being delivered / burned at any given time and, to a lesser extent, boiler furnace operating conditions / performance. There may also be hopper-to-hopper variation in fly ash composition within an ESP.

In addition to the primary ash elemental constituents, trace amounts of various elements including arsenic, antimony, carbon^(b), lead, nickel, manganese, chromium, boron, mercury^(c), selenium, beryllium, cadmium, vanadium, and uranium may be detected in the fly ash as a result of their presence in the source coal. A trace level (well below 0.1%) of bromide may be present, largely due to its presence in the powdered activated carbon used in emissions control (see below).

- (a) In addition to any residual, unburned carbon (normally anticipated to be very little), Shand fly ash may contain a small amount – typically maybe 0.5 to <1.0 wt. % – of additional carbon introduced as powdered activated carbon to help absorb mercury from the flue gas.
- (b) Typical mercury levels of perhaps 100 ppb (0.1 ppm) by weight in the fly ash in the absence of injected carbon may rise to levels of around 1,000 ppb (1 ppm) – or even to as high as 1,500 ppb (1.5 ppm) – when carbon is being injected.

Appearance: Grey to tan-grey to tan solid in the form of a fine, potentially somewhat gritty, powder.

SECTION 4: First-aid measures

4.1. Description of first aid measures

First-aid measures after inhalation	: If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER/doctor.
First-aid measures after skin contact	: If skin irritation occurs: Wash skin with plenty of water . HOWEVER , due to the potential for an enhanced available lime content of this fly ash, except in cases where only minor amounts of fly ash are still present on the skin, it is STRONGLY ADVISED that BEFORE wetting the product / skin, that the majority of the fly ash still on the skin be removed by gentle brushing – AVOID the generation of dust; also, if possible / practical, it may be advisable to perform this brushing operation outdoors; once the bulk of the fly ash has been removed from the skin, flush skin with plenty of water. Get medical attention if irritation persists. Obtain medical attention immediately if any signs of chemical or thermal burns are noted or suspected.
First-aid measures after eye contact	: IF IN EYES: immediately flush eyes with plenty of water for at least 15 minutes, including under lids. If easy to do, remove contact lenses, if worn. Get medical attention immediately.
First-aid measures after ingestion	: If swallowed, do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If conscious (and not in immediate risk of losing consciousness) and capable of swallowing, rinse mouth thoroughly with water and then drink plenty of water to dilute the material in the stomach. Get medical attention immediately.

4.2. Most important symptoms and effects (acute and delayed)

Symptoms/effects after inhalation	: May be harmful if inhaled. Causes burns to the respiratory system. Irritation may be severe. Prolonged or repeated exposure may lead to lung or other diseases.
Symptoms/effects after skin contact	: May cause burns in the presence of moisture. Symptoms may include irritation, redness, pain, blisters, serious skin burns. Irritation may be severe.
Symptoms/effects after eye contact	: Causes serious eye damage. Symptoms may include discomfort or pain, excess blinking and tear production, with marked redness and swelling of the conjunctiva. May cause serious chemical burns. Causes irritation (possibly severe). Irritation may be chemical and/or mechanical (abrasion). To some extent, burns may also be thermal due to the heat released by the reaction of alkaline ash components with moisture in the eyes.
Symptoms/effects after ingestion	: May cause burns. May cause stomach distress, nausea, vomiting and diarrhea. May be harmful if swallowed. May cause burning of mouth, throat and esophagus.

4.3. Immediate medical attention and special treatment, if necessary

Other medical advice or treatment	: Symptoms may be delayed. In case of accident or if you feel unwell, seek medical advice immediately (show the SDS where possible).
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SECTION 5: Fire-fighting measures

5.1. Suitable extinguishing media

Suitable extinguishing media	: Use extinguishing media appropriate for surrounding fire.
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5.2. Unsuitable extinguishing media

Unsuitable extinguishing media : None known.

5.3. Specific hazards arising from the hazardous product

Fire hazard : Not flammable. No known products of combustion.

5.4. Special protective equipment and precautions for fire-fighters

Protection during firefighting : Keep upwind of fire. Wear full fire fighting turn-out gear (full Bunker gear) and respiratory protection (SCBA).

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures : Restrict access to the area. Ensure clean-up is conducted by trained personnel only. Wear adequate protective clothing and equipment. Clean-up personnel need protection against contact with skin and eyes, as well as **AGAINST INHALATION OF DUST** (see Section 8). Prevent accidental contact between the spilled product and water, and **AVOID generating dust**.

6.2. Methods and materials for containment and cleaning up

For containment : Contain the spill or leak. Do not touch the spilled material. This material is a water pollutant: prevent the material from entering drains, sewers, ditches, or waterways. Wear recommended personal protective equipment.

Methods for cleaning up : Small spills: Carefully shovel into clean, dry, labelled containers and cover. **AVOID or minimize the production of dust**. Sweeping, the use of compressed air, or the use of a non-HEPA vacuum are therefore to be AVOIDED. The use of a HEPA vacuum may be acceptable. Under certain conditions, and under the advisement and supervision of a knowledgeable authority, it may be appropriate to carefully wet down the spilled material to avoid the production of dust; in this circumstance, prevent the wetting water and fly ash from entering drains, sewers, ditches, or waterways; note that contact of the fly ash with water may generate heat; note that contact with the fly ash will strongly elevate the pH of the wetting water (see Section 9); don't let the wetting water come into contact with skin or eyes; don't let the wetting water (either prior or subsequent to contact with the spilled fly ash) come into contact with stored fly ash (i.e. fly ash that is not part of the accidental release).

Large spills: Contact the appropriate emergency services and product supplier (see Section 1) for advice.

Other information : Dispose of fly ash in accordance with all applicable Federal, provincial, and local regulations. Do NOT wash fly ash into drains, sewers, ditches, or waterways.

Notify environmental authorities in the event of any reportable release of this product to the environment.

6.3. Reference to other sections

For further information refer to section 8: "Exposure controls/personal protection"

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Do not get in eyes, on skin, or on clothing. Do not swallow. **Do not breathe dust**. Wear appropriate PPE (see Section 8). When using do not eat, drink or smoke.
Use dust-tight containers and keep containers closed when not in use. Prevent accumulation of dust.

Avoid generating dust. Protect containers from physical damage. Prevent water from contacting stored product. Handle and open container with care. Empty containers may contain residues which are hazardous.

Good housekeeping is important to prevent accumulation of dust. The use of compressed air for cleaning clothing, equipment, etc, is not recommended. Use only outdoors or in a well-ventilated area.

Hygiene measures : Wash contaminated clothing before reuse. Always wash hands after handling the product.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions : Store in dust-tight, dry, labelled containers. Keep container closed when not in use. Avoid any dust buildup by frequent cleaning and suitable construction of the storage area. Do not store in an area equipped with emergency water sprinklers. Store in a well-ventilated place. Use corrosion-resistant structural materials and lighting and ventilation systems in the storage area. Store in a secure location. Keep out of the reach of children. Store locked up.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

See Section 3 regarding fly ash composition.

Exposure to this material can be controlled in many ways. The measures appropriate for a particular work site depend on how this material is used and on the extent of exposure.

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Calcium oxide (1305-78-8)		
USA - ACGIH	ACGIH TWA (mg/m ³)	2 mg/m ³
USA - ACGIH	Remark (ACGIH)	URT irr
USA - ACGIH	Regulatory reference	ACGIH 2017
Titanium dioxide (13463-67-7)		
USA - ACGIH	ACGIH TWA (mg/m ³)	10 mg/m ³
USA - ACGIH	ACGIH chemical category	Not Classifiable as a Human Carcinogen
Silica, cristobalite (14464-46-1)		
USA - ACGIH	ACGIH TWA (mg/m ³)	0.025 mg/m ³ (respirable particulate matter)
USA - ACGIH	ACGIH chemical category	Suspected Human Carcinogen
Quartz (14808-60-7)		
USA - ACGIH	ACGIH TWA (mg/m ³)	0.025 mg/m ³ (respirable particulate matter)
USA - ACGIH	ACGIH chemical category	Suspected Human Carcinogen
Particulates not otherwise regulated (PNOR) and Particulates not otherwise classified (PNOC)		
ACGIH	ACGIH TWA (mg/m ³)	10 mg/m ³ (inhalable particles) 3 mg/m ³ (respirable particles)
OSHA	OSHA PEL (TWA) (mg/m ³)	15 mg/m ³ (total dust) 5 mg/m ³ (respirable fraction)

8.2. Appropriate engineering controls

- Appropriate engineering controls : Use ventilation adequate to keep exposures (airborne levels of dust, fume, vapor, etc.) below recommended exposure limits. Use wet methods, if appropriate, to reduce the generation of dust.
- Environmental exposure controls : Maintain levels below Community environmental protection thresholds. Avoid release to the environment.

8.3. Individual protection measures/Personal protective equipment

Hand protection:

Wear suitable gloves resistant to chemical penetration

Eye protection:

Wear approved eye protection (properly fitted dust- or splash-proof chemical safety goggles) and face protection (face shield). Wearing contact lenses is not recommended.

Skin and body protection:

Wear suitable protective clothing, including appropriate boots, boot covers, overshoes, etc, as may be appropriate.

Respiratory protection:

In case of insufficient ventilation to maintain airborne fly ash levels below the exposure limits, wear suitable NIOSH-approved, properly fitted respiratory equipment. If respiratory protection is required, institute a complete respiratory protection program including selection, fit testing, training, maintenance, and inspection.

Other information:

Do not eat, smoke or drink where material is handled, processed or stored. Wash hands carefully before eating or smoking. Handle according to established industrial hygiene and safety practices.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

- Physical state : Solid (fine powder; potentially somewhat gritty)
- Appearance : Opaque fine powder.
- Colour : Gray to tan-gray to tan.
- Odour : Odourless
- Odour threshold : No data available
- pH : Approx 11.1 for 1 g ash + 99 mL; approx. 11.9 for 10 g ash + 90 mL; approx. 11.9 for 20 g ash + 80 mL water slurry
- Relative evaporation rate (butylacetate=1) : Not applicable
- Relative evaporation rate (ether=1) : Not applicable
- Melting point : No data available

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Freezing point	: No data available
Boiling point	: No data available
Flash point	: Not applicable
Auto-ignition temperature	: Not applicable
Decomposition temperature	: No data available
Flammability (solid, gas)	: Not flammable
Vapour pressure	: No data available
Vapour pressure at 50 °C	: No data available
Relative density	: A 2013/12/08, 2013/12/23 composite sample and a 2013/12/13 sample had values of 2.4. A 2010/11/01, 2010/11/05 composite sample and a 2010/12/01 sample had values of 2.6 – 2.7. Possible range not available; historically stated as 2.8 - 3.4 @ 20 °C.
Solubility	: Water: Mostly insoluble
Partition coefficient n-octanol/water	: No data available
Viscosity, kinematic	: No data available
Explosive limits	: No data available

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

Reactivity	: See Section 2.3 with respect to the possibility of enhanced chemical reactivity of the fly ash when it is hot. The fly ash, itself - particularly if moist or wet - or solutions that are or have been in contact with the fly ash may be corrosive to metals, especially aluminum metal.
Chemical stability	: Stable under normal conditions. Keep dry in storage.
Possibility of hazardous reactions	: No dangerous reactions known under normal conditions of use.
Conditions to avoid	: Incompatible materials. Moisture (reaction may generate heat). ; a high pH (alkaline, basic) leachate will result).
Incompatible materials	: Strong acids. Boric oxide. Boron trifluoride. Phosphorus pentoxide. Chlorates. Chlorine trifluoride. Chlorine. Ammonium salts. Fluorine.
Hazardous decomposition products	: None.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity (oral)	: Not classified.
Acute toxicity (dermal)	: Not classified.
Acute toxicity (inhalation)	: Not classified.

Ashes, residues (68131-74-8)	
LD50 oral rat	> 2000 mg/kg
Calcium oxide (1305-78-8)	
LD50 oral rat	> 2000 mg/kg body weight (OECD Guideline 425)
LD50 dermal rat	> 2000 mg/kg body weight (OECD Guideline 402)
LC50 inhalation rat	> 6.04 mg/l/4h
Titanium dioxide (13463-67-7)	
LD50 oral rat	> 10000 mg/kg
LC50 inhalation rat	5.09 mg/l/4h
Sulfur trioxide (7446-11-9)	
LC50 inhalation rat	1375 mg/m ³ (Exposure time: 1 h)
Barium oxide (1304-28-5)	
ATE CA (oral)	100 mg/kg bodyweight
ATE CA (Gases)	4500 ppmv/4h
ATE CA (vapours)	11 mg/l/4h
ATE CA (dust,mist)	1.5 mg/l/4h
Potassium oxide (K2O) (12136-45-7)	
LD50 oral rat	> 2000 mg/kg body weight (OECD Guideline 425)
LD50 dermal rat	> 5000 mg/kg body weight (OECD Guideline 402)
Phosphorus oxide (P2O5) (1314-56-3)	
LC50 inhalation rat	1217 mg/m ³ (Exposure time: 1 h)
LC50 inhalation rat (Dust/Mist - mg/l/4h)	0.304 mg/l/4h
ATE CA (vapours)	1.217 mg/l/4h

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Ashes, residues (68131-74-8)	
ATE CA (dust,mist)	0.304 mg/l/4h

Skin corrosion/irritation : May cause severe skin burns and eye damage. May cause skin irritation; irritation may be severe. May cause burns in the presence of moisture.
pH: Approx 11.1 for 1 g ash + 99 mL; approx. 11.9 for 10 g ash + 90 mL; approx. 11.9 for 20 g ash + 80 mL water slurry

Calcium oxide (1305-78-8)	
pH	12.5 (saturated solution)
Titanium Dioxide (13463-67-7)	
pH	7
Phosphorus oxide (P2O5) (1314-56-3)	
pH	3.6 Concentration: 0,1 g/L Remarks on result: 'other:'

Serious eye damage/irritation : May cause serious eye damage. May cause eye irritation; irritation may be severe.
pH: Approx 11.1 for 1 g ash + 99 mL; approx. 11.9 for 10 g ash + 90 mL; approx. 11.9 for 20 g ash + 80 mL water slurry

Calcium oxide (1305-78-8)	
pH	12.5 (saturated solution)
Titanium Dioxide (13463-67-7)	
pH	7
Phosphorus oxide (P2O5) (1314-56-3)	
pH	3.6 Concentration: 0,1 g/L Remarks on result: 'other:'

Respiratory or skin sensitization : Not classified.

Germ cell mutagenicity : Not classified.

Carcinogenicity : May cause cancer.

Fly ash, itself, is not listed as a carcinogen by the American Conference of Governmental Industrial Hygienists (ACGIH), the International Agency for Research on Cancer (IARC), National Toxicology Program (NTP), California Proposition 65 (CP65) or the US Occupational Health and Safety Administration (OSHA). However, respirable crystalline silica may be a component of the fly ash. Respirable crystalline silica in the form of quartz or cristobalite from occupational sources is listed by ACGIH, IARC, and NTP as a lung carcinogen or suspected carcinogen. There is limited evidence in experimental animals for the carcinogenicity of tridymite (IARC).

Potassium oxide (K2O) (12136-45-7)	
NOAEL (chronic,oral,animal/male,2 years)	≈ 1820 mg/kg body weight Animal: rat, Animal sex: male, Remarks on results: other:
Titanium dioxide (13463-67-7)	
IARC group	2B - Possibly carcinogenic to humans
In OSHA Hazard Communication Carcinogen list	Yes

Silica, cristobalite (14464-46-1)	
IARC group	1 - Carcinogenic to humans
National Toxicology Program (NTP) Status	Known Human Carcinogens
In OSHA Hazard Communication Carcinogen list	Yes

Tridymite (15468-32-3)	
IARC group	1 - Carcinogenic to humans
National Toxicology Program (NTP) Status	Known Human Carcinogens
In OSHA Hazard Communication Carcinogen list	Yes

Quartz (14808-60-7)	
IARC group	1 - Carcinogenic to humans
National Toxicology Program (NTP) Status	Known Human Carcinogens
In OSHA Hazard Communication Carcinogen list	Yes

Reproductive toxicity : Not classified.

Specific Target Organ Toxicity-single exposure : May cause respiratory irritation.

Calcium oxide (1305-78-8)	
Specific Target Organ Toxicity-single exposure	May cause respiratory irritation.
Sodium oxide (Na2O) (1313-59-3)	
Specific Target Organ Toxicity-single exposure	May cause respiratory irritation.

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Barium oxide (1304-28-5)	
STOT-single exposure	May cause respiratory irritation.

Specific Target Organ Toxicity-repeated exposure : Causes damage to Lungs through prolonged or repeated exposure.
Repeated exposure to calcium oxide has been shown to cause ulceration of the nasal septum, bronchitis and pneumonia. Chronic inhalation of silica quartz may cause autoimmune disease. Chronic exposure to an ingredient in this mixture has been reported to cause renal injury and adverse effects on visual acuity. Long term exposure to cristobalite may cause lung damage.
This product contains crystalline silica, quartz possibly up to 10% by weight. (Currently, the highest measurement obtained has been 7.7 wt. %.) Due to variability in the mined coal and the combustion process and limitations with respect to measurement, it is possible that the crystalline silica, quartz content may vary considerably, with the possibility to exceed 10% by weight crystalline silica, quartz, at least on occasion.

This product contains crystalline silica, cristobalite, indicated to be present in all 6 most current samples collected in April 2019 to be in the range 0.13 - 0.64% although its presence was not confirmed by another lab in two of the samples.

Respirable crystalline silica in the form of quartz or cristobalite from occupational sources is listed by ACGIH, IARC and NTP as a lung carcinogen or suspected carcinogen. There is limited evidence in experimental animals for the carcinogenicity of tridymite (IARC). Prolonged exposure to respirable crystalline silica has been known to cause silicosis, a lung disease, which may be disabling. While there may be a factor of individual susceptibility to a given exposure to respirable silica dust, the risk of contracting silicosis and the severity of the disease is clearly related to the amount of dust exposure and the length of time (usually years) of exposure.

Titanium dioxide is classified by IARC as a Group 2B carcinogen (possibly carcinogenic to humans). NIOSH considers ultrafine (respiratory particles with a primary particle diameter of < 100 nm) titanium dioxide as a potential occupational carcinogen, but considers there to be insufficient data to similarly classify fine titanium dioxide. Exposure to titanium dioxide dust may lead to other lung effects – e.g., fibrosis.

Silica, cristobalite (14464-46-1)	
Specific Target Organ Toxicity-repeated exposure	Causes damage to lungs through prolonged or repeated exposure.

Tridymite (15468-32-3)	
Specific Target Organ Toxicity-repeated exposure	Causes damage to lungs through prolonged or repeated exposure.

Potassium oxide (K2O) (12136-45-7)	
NOAEL (oral,rat,90 days)	≥ 1500 mg/kg body weight (OECD Guideline 422)

Quartz (14808-60-7)	
Specific Target Organ Toxicity-repeated exposure	Causes damage to lungs through prolonged or repeated exposure.

Aspiration hazard : Not classified.
Other information : Note that, to some extent, burns may be thermal as well as caustic due to the heat released by the reaction of ash components (e.g., available calcium oxide or calcium hydroxide) with moisture (e.g., eyes, mucus membranes, sweat) or due to contact with hot ash (see Section 2.3).
Symptoms/effects after inhalation : May be harmful if inhaled. Causes burns to the respiratory system. Irritation may be severe. Prolonged or repeated exposure may lead to lung or other diseases.
Symptoms/effects after skin contact : May cause burns in the presence of moisture. Symptoms may include irritation, redness, pain, blisters, serious skin burns. Irritation may be severe.
Symptoms/effects after eye contact : Causes serious eye damage. Symptoms may include discomfort or pain, excess blinking and tear production, with marked redness and swelling of the conjunctiva. May cause serious chemical burns. Causes irritation (possibly severe). Irritation may be chemical and/or mechanical (abrasion). To some extent, burns may also be thermal due to the heat released by the reaction of alkaline ash components with moisture in the eyes.
Symptoms/effects after ingestion : May cause burns. May cause stomach distress, nausea, vomiting and diarrhea. May be harmful if swallowed. May cause burning of mouth, throat and esophagus.

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : May cause long-term adverse effects in the aquatic environment.

Calcium oxide (1305-78-8)	
LC50 - Fish [1]	1070 mg/l (Exposure time: 96 h - Species: Cyprinus carpio [static])
EC50 - Crustacea [1]	49.1 mg/l Test organisms (species): Daphnia magna

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Calcium oxide (1305-78-8)	
EC50 72h - Algae [1]	> 100 mg/l Test organisms (species): Pseudokirchneriella subcapitata (previous names: Raphidocelis subcapitata, Selenastrum capricornutum)
EC50 96h - Algae [1]	1130.3 mg/l Test organisms (species): Navicula seminulum
NOEC (chronic)	32 mg/l Test organisms (species): Crangon septemspinosa Duration: '14 d'
NOEC chronic fish	100 mg/l Test organisms (species): other:Tilapia nilotica Duration: '46 d'
Titanium Dioxide (13463-67-7)	
LC50 - Fish [1]	155 mg/l Test organisms (species): other:Japanese Medaka
EC50 - Crustacea [1]	19.3 mg/l Test organisms (species): Daphnia magna
EC50 - Other aquatic organisms [1]	> 100 mg/l Test organisms (species):
EC50 - Crustacea [2]	27.8 mg/l Test organisms (species): Daphnia magna
EC50 72h - Algae [1]	> 100 mg/l Test organisms (species): Pseudokirchneriella subcapitata (previous names: Raphidocelis subcapitata, Selenastrum capricornutum)
LOEC (chronic)	5 mg/l Test organisms (species): Daphnia magna Duration: '21 d'
NOEC (chronic)	≥ 2.92 mg/l Test organisms (species): Daphnia magna Duration: '21 d'
Potassium oxide (K2O) (12136-45-7)	
LC50 - Fish [1]	917.6 mg/l Test organisms (species): other:
EC50 - Crustacea [1]	660 mg/l Test organisms (species): Daphnia magna
LC50 - Fish [2]	880 mg/l Test organisms (species): Pimephales promelas
EC50 - Crustacea [2]	630 mg/l Test organisms (species): Ceriodaphnia dubia
EC50 96h - Algae [1]	1368296 mg/l Test organisms (species): other:
NOEC (chronic)	273134 mg/l Test organisms (species): other: Duration: '30 d'
Phosphorus oxide (P2O5) (1314-56-3)	
EC50 72h - Algae [1]	66.5 mg/l Test organisms (species): Desmodesmus subspicatus (previous name: Scenedesmus subspicatus)

12.2. Persistence and degradability

Shand Fly Ash (CAS# 68131-74-8) 2020-04-13	
Persistence and degradability	Not established.

12.3. Bioaccumulative potential

Shand Fly Ash (CAS# 68131-74-8) 2020-04-13	
Bioaccumulative potential	Not established.
Calcium oxide (1305-78-8)	
BCF fish 1	(no bioaccumulation)

12.4. Mobility in soil

No additional information available

12.5. Other adverse effects

Ozone	: Not classified.
Other information	: Water in contact with the fly ash will result in the leaching of alkaline constituents from the fly ash, leading to an elevated water pH which may be harmful to aquatic organisms. No other effects known.

SECTION 13: Disposal considerations

13.1. Disposal methods

Product/Packaging disposal recommendations	: Dispose in a safe manner in accordance with local/national regulations. Notify environmental authorities in the event of any reportable release of this product to the environment.
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SECTION 14: Transport information

14.1. Basic shipping description

Ground shipment of this material is not regulated as a hazardous material / dangerous good under Canadian TDG regulations. This material IS REGULATED as a hazardous material / dangerous good, however, for the purpose of transport by aircraft.

14.2. Transport information/DOT

No additional information available

14.3. Air and sea transport

IATA

UN-No. (IATA)	: 3262
Proper Shipping Name (IATA)	: Corrosive solid, basic, inorganic, n.o.s. (Calcium oxide)

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Transport document description (IATA) : UN 3262 Corrosive solid, basic, inorganic, n.o.s., 8, III
Class (IATA) : 8 - Corrosives
Hazard Label (IATA) :



Packing group (IATA) : III - Minor Danger

SECTION 15: Regulatory information

15.1. National regulations

All components of this product are listed, or excluded from listing, on the Canadian DSL (Domestic Substances List) and NDSL (Non-Domestic Substances List) inventories.

15.2. International regulations

No additional information available

SECTION 16: Other information

Issue date : 05/26/2017
Revision date : 02/27/2023
Indication of changes:
SDS update
Other information : None.
Prepared by : Nexreg Compliance Inc.
www.Nexreg.com



Legend

ACGIH American Conference of Governmental Industrial Hygienists, Inc.
IARC International Agency for Research on Cancer
NIOSH National Institute for Occupational Health and Safety
OSHA Occupational Health and Safety Administration
TDG Transportation of Dangerous Goods, Act and Regulations (Canada)
TWA (ACGIH) Time Weighted Average (8-hour shift, 40-hour work week)

SDS Canada (GHS)_NEXREG_NEW

Disclaimer: The information contained in this document applies to the specific material named in this SDS. It may not be valid for this material if it is used in combination with any other material. It is the user's sole responsibility to determine the suitability of the material and the completeness of the information contained herein for the user's own particular use. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist. Our SDS is based only on data available at the time this SDS was prepared and is subject to change without notice as new information may be obtained. The information contained herein is believed to be accurate as of the date of the user's receipt of the material to which this SDS relates but is not all inclusive and should only be used as a guide. The Saskatchewan Power Corporation makes no representations, warranties or guarantees, express or implied, with respect to the completeness or accuracy of such information and assumes no liability in connection with the use of the material or the information contained herein. All material should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety and handling procedures. The user is solely responsible for the proper use and disposal of all material and compliance with all federal, provincial, and municipal regulations.