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Paul E. D'Amours**
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Pat Michael
Legal Assistant

May 2, 2014

Mr. Steve Dietrich
Administrator, Air Quality Division
Wyoming Department of Environmental Quality
Herschel Building
122 West 25th Street
Cheyenne, WY 82002
Via US MAIL

RE: *Violation of Air Quality Regulations by R.S.T. Excavation/R.S.T. Sand and Gravel*

Dear Mr. Dietrich:

I write on behalf of the Meadows at Melody Ranch Homeowner's Association (the "Melody Ranch HOA"). Melody Ranch is a subdivision of over 350 homes that lies directly adjacent to the Seherr-Thoss gravel operation on South Park Loop Road in Jackson, Wyoming. The Melody HOA writes to request **immediate enforcement** of the Department of Air Quality Rules and Regulations that require gravel crushing equipment to maintain and abide by valid permits from the Department of Environmental Quality Air Quality Division.

Background

The Seherr-Thoss gravel operation has been crushing gravel for at least twenty (20) years. In 1998, Mr. Seherr Thoss was issued a Notice of Violation for failure to permit in 1998, and was fined $1,500.00. In fact, only one (1) Air Quality Division permit has ever been issued to the Seherr-Thoss gravel operation. Permit No. MD-647, effective only from July 2001 to June 15, 2002 was for a portable cone crusher and a 155 hp diesel generator. (Exhibit A) When this permit expired, R.S.T Excavation was required to submit to the Division written documentation showing that the processing equipment had been removed and mining operation terminated. This never occurred, but the on-site crushing continued at ever-increasing levels. Despite the clear violation of the terms of the permit, DEQ did not take any enforcement action.

In 2008, Mr. Seherr-Thoss filed an application to install stationary crushing and screening equipment at his operation (Application AP-7895). During DEQ's permit review process, it was expressly brought to the attention of DEQ that RST Sand and Gravel had been operating crushing and screening equipment without the proper permits for many years. This permit application was put on hold, as apparently DEQ wanted to wait to see what action Teton County was taking in regard to the gravel operation on a more general level. Yet despite no permit issuance, crushing continued

and again no enforcement occurred.

In 2011, Teton County took action against the RST gravel operation for violation of the Teton County Land Development Regulations, and a week-long contested case hearing was held. Chad Schlictemeier from DEQ Air Quality Division and John Ericksen from DEQ Land Quality Division both testified. It was confirmed (and later affirmed by the District Court) that despite the ongoing crushing at the gravel operation (with crushing equipment regularly observed and documented), no valid permits existed. Even in his recent application for a small mine permit, Mr. Seherr-Thoss concedes that he is crushing gravel on site. Yet despite this repeated and clear evidence of violations, DEQ has failed and refused to take any enforcement action. While this case is currently pending before the Wyoming Supreme Court, the District Court Order, which remains valid, required Mr. Seherr-Thoss to abide by all requirements of DEQ Land and Air Quality Divisions.

In certain correspondence from DEQ, including the 2008 permit review and Notice for AP-7895 (Exhibit B) and an email from Jeff Wendt sent in 2013 (Exhibit C), it has been suggested that crushing at the Seherr-Thoss operation is "grandfathered" and therefore will not be held to certain permit standards. The Melody HOA respectfully disagrees with this statement and requests the basis for DEQ's finding that "the R.S.T. Quarry was in operation prior to 1974 and is grandfathered with respect to Air Quality permitting requirements." At the above-referenced contested case hearing, the testimony supported that the gravel operation pre-dated 1978, but no finding was made that gravel crushing was occurring before the enactment of the Environmental Quality Act in 1974. In fact, Roger Seherr-Thoss's then wife testified that the first time a crusher was on site was in 1976 (See Teton County Board of County Commissioners' Findings of Fact, Conclusions of Law and Order dated Nov. 7 2011 at p. 7 attached as Exhibit D). Moreover, it is clear from DEQ's own permit application analysis and the issuance of Permit MD-647, that even if grandfathered, permits are required for crushing equipment. An operation that is emitting harmful particulates cannot continue to do so at an ever-increasing level simply by stating that it existed before the regulations were enacted and therefore can escape any regulation.

Request for Enforcement

The terms of the permit issued to RST in 2001 included, but were not limited to the following: (1) representatives of DEQ were allowed to enter and inspect the property to investigate actual or potential sources of air pollution, and for determining compliance or noncompliance with any rules, regulations, standards, permits or orders; (2) the allowable opacity for fugitive emissions associated with the crusher were limited to 15%, with the allowable opacity conveyor transfer points, screens, and all other fugitive emission points limited to 10% as determined by 40 CFR Part 60, Appendix A. Method 9; and (3) that the crushing/screening plant shall utilize a wet suppression system at all times the crushing/screening plant is in use...and operated to the extent necessary to comply with the allowable opacity limit established in Condition 4.

The very terms of this permit makes clear that there are conditions and safeguards that must be in place and enforced to ensure the health, safety and welfare of neighbors and others that may be affected by the air pollution caused by the crushing

activities. By virtue of its failure to follow its own regulations to ensure that permits are in place and permit conditions monitored, it is impossible to know whether any of the above-listed conditions are being met. Clearly these conditions are meaningful, or they would not have been imposed in the first place.

Recent articles and information from OSHA have confirmed and highlighted the known risks of exposure to chrystalline silica. As I am sure you are aware, chyrystalline silica is found in soil, dust and rock and exposure to airborne silica particles is known to cause silicosis (a progressive, disabling lung disease), and cancer. (See OSHA Fact Sheet and OSHA "It's Not Just Dust" attached hereto as Exhibit E). In fact, the National Toxicology Program, Department of Health and Human Services Report on Carcinogens (12th Edition, 2011)(Exhibit F) states: "Residents near quarries and sand and gravel operations potentially are exposed to respirable crystalline silica." This knowledge makes it even more crucial that DEQ undertake the enforcement and monitoring required. *See also* Washington State Department of Ecology: Focus; Controlling Air Pollution Aggregate Industry (Exhibit G).

The Seherr-Thoss operation has no Air Quality Division permits, no monitoring is occurring, and the Seherr-Thoss neighbors are being exposed to uncertain levels of potentially dangerous air particulate that are entirely unregulated by the very entity charged with doing so. **The Melody Ranch HOA respectfully requests that the DEQ take immediate and substantial enforcement action against these violations.**

Regards,

Nicole G. Krieger

Nicole G. Krieger
Attorney for the Meadows at Melody Ranch
Homeowners Association

cc: Melody Ranch HOA Board of Directors, Mr. Jeff Wendt, Mr. Jeremiah Williamson, Esq. Mr. Keith Gingery, Ms. Erin Weisman, Teton County Board of County Commissioners (c/o Sandy Birdyshaw), Mr. Tyler Sinclair, Ms. Jennifer Anderson, Mr. Steve Ashworth

EXHIBIT A

The State
of Wyoming

Jim Geringer, Governor

Department of Environmental Quality

Herschler Building • 122 West 25th Street • Cheyenne, Wyoming 82002

ADMIN/OUTREACH	ABANDONED MINES	AIR QUALITY	INDUSTRIAL SITING	LAND QUALITY	SOLID & HAZ. WASTE	WATER QUALITY
(307) 777-7756	(307) 777-6145	(307) 777-7391	(307) 777-7368	(307) 777-7756	(307) 777-7752	(307) 777-7781
FAX 777-3610	FAX 777-6462	FAX 777-5616	FAX 777-6937	FAX 777-5861	FAX 777-5973	FAX 777-5973

July 30, 2001

RECEIVED
AUG 0 9 2001
AIR QUALITY DIVISION
LANDER, WYOMING

Mr. Roger Seherr-Thoss
R.S.T. Excavation
P.O. Box 1654
Jackson, WY 83001

Permit No. **MD-647**

Dear Mr. Seherr-Thoss:

The Division of Air Quality of the Wyoming Department of Environmental Quality has completed final review of R.S.T. Excavation's application to construct a portable cone crusher and 155 hp diesel generator at the quarry located on 4650 South Park Loop Road, Jackson, in Teton County, Wyoming. The proposed crushing equipment will be operated in conjunction with the screening plant already permitted for this location.

Following this agency's proposed approval of the request as published June 6, 2001 and in accordance with Chapter 6, Section 2(m) of the Wyoming Air Quality Standards and Regulations, the public was afforded a 30-day period in which to submit comments concerning the proposed modification, and an opportunity for a public hearing. No comments have been received. Therefore, on the basis of the information provided to us, approval to construct a portable cone crusher and 155 hp diesel generator at the quarry as described in the application is hereby granted pursuant to Chapter 6, Section 2 of the regulations with the following conditions:

1. That authorized representatives of the Division of Air Quality be given permission to enter and inspect any property, premise or place on or at which an air pollution source is located or is being constructed or installed for the purpose of investigating actual or potential sources of air pollution, and for determining compliance or non-compliance with any rules, regulations, standards, permits or orders.

2. That all substantive commitments and descriptions set forth in the application for this permit, unless superseded by a specific condition of this permit, are incorporated herein by this reference and are enforceable as conditions of this permit.

3. That all notifications, reports and correspondences associated with this permit shall be submitted to the Stationary Source Compliance Program Manager, Air Quality Division, 122 West 25th Street, Cheyenne, WY 82002.

4. That the allowable opacity for fugitive emissions associated with the crusher shall be limited to 15%, the allowable opacity conveyor transfer points, screens and all other fugitive emission points shall be limited to 10% as determined by 40 CFR Part 60, Appendix A, Method 9.

EXHIBIT
A
Blumberg No. 5208

5. That the crushing/screening plant shall utilize a wet suppression system at all times the crushing/screening plant is in use. The wet suppression system shall be located at all belt transfer points, and discharge points off the crushers and operated to the extent necessary to comply with the allowable opacity limit established in Condition 4.

6. That R.S.T Excavation shall comply with the requirements of 40 CFR, Part 60, Subpart OOO.

7. That all unpaved portions of the haul roads, access roads, work areas, and stockpiles associated with this plant shall be treated with water and/or chemical dust suppressants on a schedule sufficient to control fugitive dust from vehicular traffic and wind erosion.

8. In accordance with Chapter 6, Section 2(b)(ii) of the Wyoming Air Quality Standards and Regulations, R.S.T Excavation shall submit a self issuance relocate permit for each new location. Such permit shall be executed and copies provided to the Air Quality Division prior to operation at the new location. A fee will be assessed upon issuance of the relocation permit.

9. Operations at this site shall cease as of June 15, 2002. RST Excavation shall submit to the Division, in writing documentation showing that the processing equipment has been removed and mining operation terminated. This verification is due before July 15, 2002 (30 days following this permit term end).

11. That all conditions of Air Qaulity Permit Waiver AP-VK0 shall be superseded by the conditions of this permit.

It must be noted that this approval does not relieve you of your obligation to comply with all applicable county, state, and federal standards, regulations or ordinances. Special attention must be given to Chapter 6, Section 2 of the Wyoming Air Quality Standards and Regulations. Any appeal of this permit as a final action of the Department must be made to the Environmental Quality Council within sixty (60) days of permit issuance per Section 16, Chapter I, General Rules of Practice and Procedure, Department of Environmental Quality.

If we may be of further assistance to you, please feel free to contact this office.

Sincerely,

Dan Olson
Administrator
Air Quality Division

Dennis Hemmer
Director
Dept. of Environmental Quality

cc: Tony Hoyt

EXHIBIT B

DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION

Permit Application Analysis
AP-7895

July 29, 2008

NAME OF FIRM:	R.S.T. Sand - Gravel
NAME OF MINE:	R.S.T. Quarry
LOCATION OF MINE:	SW¼NE¼ of Section 19, T40N, R116W Teton County, Wyoming
TYPE OF OPERATION:	Stationary Crushing/Screening Equipment
RESPONSIBLE OFFICIAL:	Roger Seherr-Thoss, President
MAILING ADDRESS:	P.O. Box 1709 Jackson, WY 83001
TELEPHONE:	(307) 733-5511
REVIEWING ENGINEER:	Nick Meeker, Air Quality Engineer

PURPOSE OF APPLICATION:

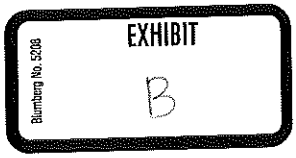
On June 11, 2008, the Division of Air Quality received an application from R.S.T. Sand - Gravel to install stationary crushing and screening equipment located at the R.S.T. Quarry in the SW¼NE¼ of Section 19, T40N, R116W, approximately five (5) miles south southwest of Jackson, in Teton County, Wyoming. Maximum production for the crushing/screening equipment is reported at 16,800 tons per year (tpy) and 100 tons per hour (tph). The R.S.T. Quarry was in operation prior to 1974 and is grandfathered with respect to Air Quality permitting requirements.

PROPOSED EQUIPMENT:

- 2001 CEC Cone-IT Crusher (SN – 00520)
- 2001 CEC Cedar Crusher (SN – 21283)
- 1999 CEC Screen
- 1987 L-Jax Screen (SN – 46372)
- 80hp Caterpillar Diesel Generator (SN – 4262)
- Four (4) Conveyor Belts and Four (4) Transfer Points

PERMIT HISTORY:

The R.S.T. Quarry is a grandfathered facility with respect to Chapter 6, Section 2 of the Wyoming Air Quality Standards and Regulations (WAQSR), as it was in operation before 1974.



ESTIMATED EMISSIONS:

The pollutants of concern are fugitive particulate matter emitted from the crushing/screening operations. The Division estimated emissions based on EPA document, AP-42, "Compilation of Emission Factors". Application of water during crushing/screening operations is credited for 50% control efficiency. Table 1 lists emission factors for the generator. Table 2 lists the estimated emissions from the generator and crushing/screening operations based on 16,800 tpy of produced material. The major pollutants emitted from the generator include nitrogen oxides (NO_X) with some carbon monoxide (CO) from incomplete combustion. Volatile organic compounds (VOCs), including some hazardous air pollutants (HAPs), and sulfur oxides (SO_X) will also be emitted from the generator. The generator will be diesel fired. Emission calculations are detailed in Appendix A.

Table 1: Emission Factors (g/hp-hr)[1]

Engine	hp	Controls	NO_x	CO	VOC	PM_{10}	SO_2[3]
Caterpillar Diesel Generator (SN – 4262)[2]	80	Tier III	3.5	3.7	1.0	0.3	0.9

[1] Emissions estimated to nearest 0.1 ton

[2] Emissions are based on 168 hours of operation per year

[3] Emission factor was determined from AP-42 Table 3.3-1 – *Emission Factors for Uncontrolled Gasoline and Diesel Industrial Engines*

Table 2: Estimated Emissions, tpy[1]

Source	TSP	PM_{10}	NO_X	CO	VOC	SO_x
2001 CEC Cone-IT Crusher (SN – 00520)	<0.1	<0.1	--	--	--	--
2001 CEC Cedar Crusher (SN – 21283)	<0.1	<0.1	--	--	--	--
1999 CEC Screen	0.1	<0.1	--	--	--	--
1987 L-Jax Screen (SN – 46372)	0.1	<0.1	--	--	--	--
Four (4) Conveyor Transfer/Drop Points	<0.1	<0.1	--	--	--	--
Caterpillar Diesel Generator (SN – 4262)	--	<0.1	0.1	0.1	<0.1	<0.1
Total Emissions	**0.2**	**<0.1**	**0.1**	**0.1**	**<0.1**	**<0.1**

[1] Emissions estimated to nearest 0.1 ton

[2] Based on 168 hours of operation per year

BEST AVAILABLE CONTROL TECHNOLOGY (BACT):

The Division considers the use of water and/or chemical dust suppressants on the work areas, access roads and haul roads to represent BACT for this type of operation.

BACT for crushing/screening operations shall consist of a wet suppression system to control fugitive emissions from the crushing/screening equipment and shall be operated to the extent necessary to limit visible emissions to twenty (20) percent opacity, or limits set to comply with 40 CFR, part 60, subpart OOO.

The Caterpillar diesel generator (SN – 4262) will meet Tier 3 emission standards for non-road diesel engines. The Division considers meeting Tier 3 emission standards as representing BACT for this type of generator.

CHAPTER 6, SECTION 3 APPLICABILITY:

The crushing/screening equipment is not a "major source" as defined by Chapter 6, Section 3 of the Wyoming Air Quality Standards and Regulations (WAQSR). Emissions do not exceed the 100 tpy threshold of any regulated pollutant.

NEW SOURCE PERFORMANCE STANDARDS (NSPS):

All crushing/screening equipment located at this site will not be subject to 40 CFR, part 60, subpart OOO Standards of Performance for Nonmetallic Mineral Processing Plants. The portable crushing/screening equipment is not subject to 40 CFR, part 60, subpart OOO because the proposed equipment has a production rate under 150 tons per hour.

PREVENTION OF SIGNIFICANT DETERIORATION (PSD):

The proposed equipment is not a "major emitting facility" as defined by Chapter 6, Section 4 of the Wyoming Air Quality Standards and Regulations. Therefore, further analysis is not required under this section.

AMBIENT AIR QUALITY:

It is the Division's experience that ambient air quality standards will be maintained with the utilization of the control measures recognized as BACT for crushing/screening operations.

PROPOSED PERMIT CONDITIONS FOR STATIONARY MINING EQUIPMENT:

The Division is proposing to issue a construction permit to R.S.T. Sand - Gravel for the stationary crushing/screening equipment subject to the following conditions:

1. Authorized representatives of the Division of Air Quality shall be given permission to enter and inspect any property, premise or place on or at which an air pollution source is located or is being constructed or installed for the purpose of investigating actual or potential sources of air pollution, and for determining compliance or non-compliance with any rules, standards, permits or orders.

2. All substantive commitments and descriptions set forth in the application for this permit, unless superseded by a specific condition of this permit, are incorporated herein by this reference and are enforceable as conditions of this permit.

3. All notifications, reports and correspondence associated with this permit shall be submitted to the Stationary Source Compliance Program Manager, Air Quality Division, 122 West 25th Street, Cheyenne, WY 82002.

4. That the date of commencement of construction shall be reported to the Administrator within 30 days of commencement. In accordance with Chapter 6, Section 2(h) of the WAQSR, approval to construct or modify shall become invalid if construction is not commenced within 24 months after receipt of such approval or if construction is discontinued for a period of 24 months or more. The Administrator may extend the period based on satisfactory justification of the requested extension.

5. That the allowable opacity for fugitive emissions associated with crushing/screening equipment and all other fugitive emission points shall be limited to 20% as determined by 40 CFR, part 60, Appendix A, Method 9.

6. That the crushing equipment shall be equipped with a wet suppression system to control fugitive emissions from the crushing equipment. The wet suppression system shall operated to the extent necessary comply with the allowable opacity limits established in condition 5.

7. That all unpaved portions of the haul roads, access roads, work areas and stockpiles associated with this crushing equipment shall be treated with water and/or chemical dust suppressants on a schedule sufficient to control fugitive dust from vehicular traffic and wind erosion.

8. That the Caterpillar diesel generator (SN – 4262) shall be certified to meet EPA Tier III emission levels.

9. In accordance with Chapter 6, Section 2(b)(ii) of the WAQSR, R.S.T. Sand - Gravel shall submit a "self-issuance" relocate permit for each new location. Such permit shall be executed and copies provided to the Air Quality Division prior to operation at the new location. A fee will be assessed upon issuance of the relocation permit.

10. R.S.T. Sand - Gravel shall keep a copy of the permit, the relocation permit and the Tier III certification for the Caterpillar diesel generator (SN – 4262) with the stationary crushing/screening equipment at all times.

APPENDIX A

Emission Estimates

CRUSHING EMISSIONS

Based on a 16,800 tpy throughput, TSP and PM_{10} emissions associated with crushing operations were estimated as follows:

Crushing: 0.0054 lb/ton TSP, 0.0024 lb/ton PM_{10}
AP-42 Table 11.19.2-2 8/04

$$\text{TSP Emissions} = \frac{16{,}800\frac{ton}{year} x 0.0054\frac{lb}{ton} x(1-0.50)}{2{,}000\frac{lb}{ton}} = 0.02\frac{ton}{year} \text{ (50\% control)}$$

$$PM_{10}\text{ Emissions} = \frac{16{,}800\frac{ton}{year} x 0.0024\frac{lb}{ton} x(1-0.50)}{2{,}000\frac{lb}{ton}} = 0.01\frac{ton}{year} \text{ (50\% control)}$$

SCREENING EMISSIONS:

Based on a 16,800 tpy maximum production rate, TSP and PM_{10} emissions associated with screening operations were estimated as follows:

Screening: 0.025 lb/ton TSP, 0.0087 lb/ton PM_{10}
AP-42 Table 11.19.2-2 8/04

$$\text{TSP Emissions} = \frac{16{,}800\frac{ton}{year} x 0.025\frac{lb}{ton} x(1-0.50)}{2{,}000\frac{lb}{ton}} = 0.11\frac{ton}{year} \text{ (50\% control)}$$

$$PM_{10}\text{ Emissions} = \frac{16{,}800\frac{ton}{year} x 0.0087\frac{lb}{ton} x(1-0.50)}{2{,}000\frac{lb}{ton}} = 0.04\frac{ton}{year} \text{ (50\% control)}$$

CONVEYOR TRANSFER POINT EMISSIONS:

Based on a 16,800 tpy maximum production rate, TSP and PM_{10} emissions associated with six (6) conveyor transfer points were estimated as follows:

Conveyor transfer point:	0.0030 lb/ton TSP, 0.0011 lb/ton PM_{10}
	AP-42 Table 11.19.2-2 8/04

$$\text{TSP Emissions} = \frac{16{,}800\frac{ton}{year}\,x0.0030\frac{lb}{ton}\,x(1-0.50)}{2{,}000\frac{lb}{ton}} = 0.01\frac{ton}{year}\ \text{(50\%control) per transfer point}$$

TSP Emissions = 0.01 tpy *x* 4 transfer points = 0.04 tpy

$$PM_{10}\ \text{Emissions} = \frac{16{,}800\frac{ton}{year}\,x0.0011\frac{lb}{ton}\,x(1-0.50)}{2{,}000\frac{lb}{ton}} = 0.005\frac{ton}{year}\ \text{(50\% control) per transfer point}$$

PM_{10} Emissions = 0.005 tpy *x* 4 transfer points = 0.02 tpy

GENERATOR EMISSIONS:

Caterpillar Diesel Generator (SN – 4262)

Emission Summary					
Power (hp)	NO_x (lb/hr-hp)	CO (lb/hr-hp)	VOC (lb/hr-hp)	PM_{10} (lb/hr-hp)	SO_2 (lb/hr-hp)
80	0.0077	0.0082	0.0022	0.0007	0.00205

[1] Emissions from AP-42 – *Stationary Internal Combustion Source, Chapter 3.3, Table 3.3-1*

Hours of Operation: 168 hours per year

NO_x:

$$\text{Emission Factor} = 0.0077\frac{lb}{hp-hr}\,x453.59\frac{gram}{lb} = 3.5\frac{g}{hp-hr}$$

$$\text{Emissions} = 0.0077\frac{lb}{hp-hr}\,x168\frac{hr}{yr}\,x80hpx\frac{ton}{2000lb} = 0.052\frac{ton}{yr}$$

CO:

$$\text{Emission Factor} = 0.0082\frac{lb}{hp-hr}x453.59\frac{gram}{lb} = 3.7\frac{g}{hp-hr}$$

$$\text{Emissions} = 0.0082\frac{lb}{hp-hr}x168\frac{hr}{yr}x80hpx\frac{ton}{2000lb} = 0.06\frac{ton}{yr}$$

VOC:

$$\text{Emission Factor} = 0.0022\frac{lb}{hp-hr}x453.59\frac{gram}{lb} = 1.0\frac{g}{hp-hr}$$

$$\text{Emissions} = 0.0022\frac{lb}{hp-hr}x168\frac{hr}{yr}x80hpx\frac{ton}{2000lb} = 0.02\frac{ton}{yr}$$

PM:

$$\text{Emission Factor} = 0.0007\frac{lb}{hp-hr}x453.59\frac{gram}{lb} = 0.3\frac{g}{hp-hr}$$

$$\text{Emissions} = 0.0007\frac{lb}{hp-hr}x168\frac{hr}{yr}x80hpx\frac{ton}{2000lb} = 0.005\frac{ton}{yr}$$

SO_2:

SO_x Emission factor from AP-42 Table 3.3-1 – *Emission Factors for Uncontrolled Gasoline and Diesel Industrial Engines* is 0.00205 lb/hp-hr.

$$SO_x \text{ Emission factor} = 0.00205\frac{lb}{hp-hr}x453.59\frac{g}{lb} = 0.9\frac{g}{hp-hr}$$

$$SO_x \text{ Emissions} = 0.9\frac{g}{hp-hr}x168\frac{hr}{yr}x\frac{1}{453.59}\frac{lb}{g}x\frac{1}{2000}\frac{ton}{lb}x80hp = 0.013\frac{ton}{yr}$$

Table 3: Engine Emission Factors, g/hp-hr [1,2]

Source	hp	SN	NO_X	CO	VOC	PM_{10}	SO_2 [2]
Caterpillar Diesel Generator	80	4262	3.5	3.7	1.0	0.3	0.9

[1] Emissions estimated to nearest 0.1 ton

[2] Emission factor was determined from AP-42 Table 3.3-1 – *Emission Factors for Uncontrolled Gasoline and Diesel Industrial Engines*

Table 4: Emissions Summary [1,2]

	NO_x		CO		VOC		PM_{10}		SO_2	
Source	lb/hp-hr	TPY	lb/hp-hr	TPY	lb/hp-hr	TPY	lb/hp-hr	TPY	lb/hp-hr	TPY
Caterpillar Diesel Generator (SN – 4262)	0.0077	0.1	0.0082	0.1	0.0022	<0.1	0.0007	<0.1	0.00205	<0.1

[1] Emissions estimated to nearest 0.1 ton

[2] Emissions are based on 168 hours of operation per year

Reviewer NCM
Copy to:
Cynthia
D.E.
File: 7895

STATE OF WYOMING
Department of Environmental Quality - Air Quality Division
Crushing/Screening Operations
Permit Application Form
(Please submit three (3) copies of the complete application)

Company Name: R.S.T. SAND - GRAVEL
Contact: ROGER Scherr-Thoss Title: OWNER
Mailing Address: P.O. Box 1709
City: JACKSON State: WYO Zip: 83001
Phone: 307-733-5511 Fax: 307-733-2349 E-Mail:

Initial Location
Legal Description: 1/4: 19 1/4: _____ Section: _____ T: _____ N R: _____ W
Latitude: _____ Longitude: _____
County: TETON

Existing Pit/Quarry: ☑ Yes ☐ No
Pit/Quarry Name: R.S.T. Pit/Quarry Owner: R.S.T.
AQD Permit Number: 48-01544

Type of Material Crushed/Screened: PIT RUN
Max. Hourly Production: 100 Tons/hr Max. Annual Production: _____ Tons per year
Ave. Hourly Production: 95 Tons/hr
Hours of Operation: 9 Hours/day 3 Days/week 7 Weeks/year

Equipment/Operation: (mark all that apply)
☑ Crushing ☐ Screening
☑ Wet Screening ☐ Stock Piling

Is the equipment intended for stationary or portable use: ☑ Stationary ☐ Portable

All applications must include:

1. **Documentation that the proposed site is located in accordance with proper land use planning as determined by the appropriate state or local agency charged with such responsibility.**
   (Per Chapter 6, Section 2(c)(iv) of the WAQSR.)
2. **A map identifying the location of the site.**
3. **A map identifying all haul roads, including county roads and any other unpaved roads, associated with the crushing/screening activities. Please indicate the distance material will be hauled until reaching pavement.**
4. **Brief process description with a plot plan depicting site set up with location of controls.**

I, _____
Responsible Official **Title**
state that I have knowledge of the facts herein set forth and that the same are true and correct to the best of my knowledge and belief. The facility will operate in compliance with all Wyoming Air Quality Standards and Regulations.

Signature: Roger Scherr-Thoss Date: 6-7-08

RECEIVED JUN 2008 AIR QUALITY DIVISION

FORM: AQD-CS1	Excel Format	REVISED: December 2004

STATE OF WYOMING
Department of Environmental Quality - Air Quality Division
Crushing/Screening Operations
Crusher/Screen Form

Crusher

Primary: ☑ Secondary: ☐ Tertiary: ☐ Other: _____
(Use additional Crusher/Screen Forms if using more than 2 crushers)

Manufacturer: CEC Model #: CEC CONE-JT Serial #: [redacted] 00520

Type: ☐ Jaw ☑ Cone ☐ Impact ☐ Other Type: _____

Date Manufactured: 2001 Max. Crusher Capacity per Hour: 95 tons

Subject to NSPS - OOO (manufactured after August 1, 1985): ☐ Yes ☑ No

Crusher

Primary: ☑ Secondary: ☐ Tertiary: ☐ Other: _____
(Use additional Crusher/Screen Forms if using more than 2 crushers)

Manufacturer: [redacted] CEDAR Model #: [redacted] CEDAR Serial #: [redacted] 21283

Type: ☐ Jaw ☐ Cone ☐ Impact ☐ Other Type: _____

Date Manufactured: 2001 Max. Crusher Capacity per Hour: _____ tons

Subject to NSPS - OOO (manufactured after August 1, 1985): ☐ Yes ☑ No

Screen

Manufacturer: CEC Model #: CEC Serial #: _____

Date Manufactured: 1999 Type: CEC

Subject to NSPS - OOO (manufactured after August 1, 1985): ☐ Yes ☑ No
(Use additional Crusher/Screen Forms if using more than 2 screens)

Screen

Manufacturer: L-JAX Model #: L-JAX Serial #: 4B372

Date Manufactured: 1997 Type: SCREEN

Subject to NSPS - OOO (manufactured after August 1, 1985): ☐ Yes ☑ No
(Use additional Crusher/Screen Forms if using more than 2 screens)

# of Conveyor Belts: 4 Number of Transfer/Drop Points: 4

# of Stockpiles: 4 Size of Stock Piles: 250 tons

Source Control Sources will be controlled as follows:

	No Control	Water Spray	Chemical Dust Suppresant	Other (explain)	
Feed hopper	☐	☐	☐	☐	
Transfer Points	☐	☐	☐	☐	
Inlet to Crushers	☐	☑	☐	☐	
Outlet of Crushers	☐	☐	☐	☐	
Inlet to Screens	☐	☑	☐	☐	
Outlet of Screens	☐	☑	☐	☐	
Haul Roads	☐	☑	☐	☐	
Work Areas	☐	☑	☐	☐	
Stockpiles	☐	☑	☐	☐	

STATE OF WYOMING
Department of Environmental Quality - Air Quality Division
Crushing/Screening Operations
Generator Form

Generator #1 Information: (Use additional Generator Forms if using more than 2 Generators)

Manufacturer: CAT Model #: CAT Serial #: 4162

Site Horsepower Rating: 80 HP

Fuel Type:

☐ Natural Gas ☐ LP Gas ☑ Diesel ☐ Gasoline

Fuel Consumption (specify units): _____ Fuel Sulfur Content (specify units): _____

Emissions Data:

	g/hp-hr	lb/hr	TPY
NO_x			
CO			
VOC			
PM_{10}			
SO_x			

Emissions Control:

☐ Lean Burn ☐ Other
☐ AFRC Describe:
☐ NSCR
☐ SCR
☐ Tier I Certified
☐ Tier II Certified
☑ Tier III Certified

Generator #2 Information: (Use additional Generator Forms if using more than 2 Generators)

Manufacturer: _____ Model #: _____ Serial #: _____

Site Horsepower Rating: _____

Fuel Type:

☐ Natural Gas ☐ LP Gas ☐ Diesel ☐ Gasoline

Fuel Consumption (specify units): _____ Fuel Sulfur Content (specify units): _____

Emissions Data:

	g/hp-hr	lb/hr	TPY
NO_x			
CO			
VOC			
PM_{10}			
SO_x			

Emissions Control:

☐ Lean Burn ☐ Other
☐ AFRC Describe:
☐ NSCR
☐ SCR
☐ Tier I Certified
☐ Tier II Certified
☐ Tier III Certified

Additional Information:

Please use the following hierarchy for determining emissions from generators

1. g/hp-hr emission rates based on manufacturer's information. Provide a copy of the manufacturer's information with the application.

2. g/hp-hr emission rates based on actual test data. Provide a copy of the test report with the application.

3. Emission factors. Documentation from the manufacturer must be provided with the application stating no emission factors are available for the generator before the Division will accept other emission factors such as AP-42.

STATE OF WYOMING

Department of Environmental Quality - Air Quality Division

Crushing/Screening Operations

Emission Summary Form

Fill out this portion of the form for every emission source (existing & proposed)

Source	PM_{10}	NO_x	CO	VOC	SO_2
	TPY	TPY	TPY	TPY	TPY
Total					

FORM: AQD-CS4	Excel Format	REVISED: December 2004

EXHIBIT C

From: Jeff Wendt <jeff.wendt@wyo.gov>
Subject: Re: RST Excavation/RST Sand and Gravel/RST Trucking/Roger Seherr-Thoss
Date: November 4, 2013 8:17:52 AM MST
To: Nicole Krieger <nicole@hcdlawyers.com>

Nicole:

Follow up information: I spoke with permitting today and they said the reason the applications for air permits mentioned in my previous email never made it to actual permits was due to the Division being unable to issue permits without Teton County's approval of the facility. Permitting also told me that whatever operation RST has been doing at this site is "grandfathered" as far as air permitting goes. Based on this information, it appears unlikely that an air permit will be issued until the situation resolves itself, but it also appears unlikely that the Air Quality Division would have any concern with the current operations at the facility. If you have any questions or concerns, please contact me directly.

Thanks,

Jeff Wendt

Jeff Wendt, P.E.
Air Quality Engineer

State of Wyoming
Department of Environmental Quality
Air Quality Division, District V
510 Meadowview Dr.
Lander, WY 82520

307-335-6937 (Office)
307-714-2273 (Mobile)
307-332-7726 (Fax)

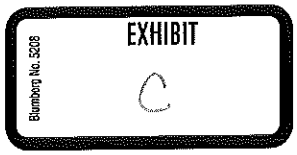
On Fri, Nov 1, 2013 at 1:19 PM, Jeff Wendt <jeff.wendt@wyo.gov> wrote:
Nicole:

I've reviewed the records in the District 5 database as well as the current state database, and have the following information at hand (bold text) to answer what I can regarding your questions, copied verbatim:

1. What permits have been issued for crushing activity for any of the above-listed entities and are any of those permits still valid? If not, when did they expire.
We show the following permit on file for RST Excavation: MD-647. I've attached a pdf copy of this permit. It states that operations should have ceased, assuming this is the same site as the present day one, in 2002. See condition (9). Our file here shows no documentation of the removal of the equipment as was required, but this documentation may be in Cheyenne. There are no facilities or permits on file for RST Trucking or Roger Seher Thoss.

2. What permits have been applied for by any of the above-listed entities and where are those applications in your process.
According to our records, there have been permit applications as recently as 2010. See the also attached summary of correspondence. The Applications we show recorded were AP-7895 in 2008 and AP-10965 in 2010. I called for an update on these and the person in permitting was not in today, but should be back Monday. I will call him on Monday and get more information on this situation and the status of the permits. Apparently this has been an ongoing issue for some time now.

3. If there are not current/valid permits, what is the enforcement process. The best information we have is that Mr. Seherr Thoss has continued to crush gravel continuously since at least the mid 1990s.
Mr Seherr Thoss was issued a Notice of Violation for failure to permit in 1998 and fined $1500.00. It would appear that further NOV action may be warranted in this situation, but that won't be clear until further details are known to the Division. I was told that the location does not have a crusher operating (which may or may not be accurate), so an AQD permit may not be required. After I get more information on this situation from the permitting side, someone in the Lander office here may deem it necessary to follow up probably by visiting the location to establish violations. The NOV process is a long and tangled one, so I cannot give you any assurance that the matter would be resolved



quickly or even to your satisfaction, assuming violations are found to have occurred.

4. What crushing/processing activities are permitted absent an Air Quality Permit?
Please review the Wyoming Air Quality Standards and Regulations, specifically Chapter 6, Section 2 for more information on permitting requirements. This may be found at http://soswy.state.wy.us/Rules/RULES/8973.pdf, **or you can obtain access to any of the chapters at** http://soswy.state.wy.us/Rules/default.aspx **by selecting Environmental Quality under agency and Air Quality under program, Current Rules and Regulations in Rule Type. Basically any activity which produces emissions which may be a health hazard (i.e. fugitive dust) do need to go through the permitting process, however.**

If you give me a call Monday afternoon, I should have more information from the permitting side of things regarding those two applications which do not appear to have resulted in granted permits yet.

Jeff Wendt, P.E.
Air Quality Engineer

State of Wyoming
Department of Environmental Quality
Air Quality Division, District V
510 Meadowview Dr.
Lander, WY 82520

307-335-6937 (Office)
307-714-2273 (Mobile)
307-332-7726 (Fax)

On Fri, Nov 1, 2013 at 10:36 AM, Nicole Krieger <nicole@hcdlawyers.com> wrote:
Dear Jeff:

Thanks for taking the time to speak with me. The records that I am requesting are as follows:

1. What permits have been issued for crushing activity for any of the above-listed entities and are any of those permits still valid? If not, when did they expire.

2. What permits have been applied for by any of the above-listed entities and where are those applications in your process.

3. If there are not current/valid permits, what is the enforcement process. The best information we have is that Mr. Seherr Thoss has continued to crush gravel continuously since at least the mid 1990s.

4. What crushing/processing activities are permitted absent an Air Quality Permit?

Thank you in advance for your assistance.

Nicole

Nicole G. Krieger
Hess D'Amours & Krieger, LLC
Post Office Box 449
30 East Simpson Street
Jackson, WY 83001

307.733.7881 (phone)
307.733.7882 (fax)
nicole@hcdlawyers.com

E-Mail to and from me, in connection with the transaction of public business, is subject to the Wyoming Public Records Act and may be disclosed to third parties.

EXHIBIT D

however she admittedly could not recall the amount of production with any certainty. *Tr., p 231.*

33. Ms. Higgins testified that a pond was dug on the property in 1973-1974. It was a gravel pond that was later stocked with fish. *Tr., p. 213.* She testified that they extracted gravel from two places on the land – the pond nearer to Seherr-Thoss' father's home and a small pit behind their trailer house. *Tr., pp. 214-215.* It was also noted that Ms. Higgins' testimony was disputed by the testimony of Mr. John Erickson from DEQ who testified that from his inspection in 1995, the area near their trailer house had never been excavated. *Tr., p. 410.*

34. Ms. Higgins testified that probably around 1976 she remembered the first crusher being set up behind their shop. *Tr., p. 217.* They initially leased a small portable crusher, and ultimately purchased a crusher. Ms. Higgins could not testify with any certainty to the details of the crusher, for example what color it was, and if the photo of the crusher in Exhibit 113 was the original crusher on the property or the one they purchased later. *Tr., pp. 233-235.*

35. Ms. Higgins testified that she did the books for the business and remembers that they sold gravel to Teton County Road, Bridge & Levee Department, through supervisor Corky Moyer. She remembered that Corky Moyer was a customer because she also worked for Moyer at Road and Bridge for many years in the 1970s. *Tr., pp. 230, 236.*

36. Ms. Higgins obviously had a good opportunity to observe the operations and would have direct and personal knowledge of Seherr-Thoss' intent at the time. The details, such as to the color of the crusher, or who exactly all the customers were, would understandably not stick in a person's mind some 33 years later. In addition, given the estranged relationship between the parties since 1985 she would not appear to have any interest in the matter. Consequently, her testimony was deemed credible and entitled to considerable weight. It was noted however, that even though Ms. Higgins may not have an interest in the outcome that her son's primary business is the current gravel operation. *(Tr., pp. 222-223).* This Hearing Officer also found it somewhat interesting that Ms. Higgins was in attendance for most of the rest of the hearing, returning the day after her testimony was provided.

37. Miles Roice seemed to be a very credible and convincing witness with a good opportunity to observe the operations and without any bias or prejudice in favor or against one party or the other. Mr. Roice testified that his family owned property on the bench overlooking the Seherr-Thoss Ranch. He was certain that the Seherr-Thoss and his father were conducting a gravel operation on their property prior to 1978, because his family was also in the gravel business, and they were paying attention to the operation because they viewed it as competition. Indeed he

EXHIBIT E

FACT

What is crystalline silica?

Crystalline silica is a basic component of soil, sand, granite, and many other minerals. Quartz is the most common form of crystalline silica. Cristobalite and tridymite are two other forms of crystalline silica. All three forms may become respirable size particles when workers chip, cut, drill, or grind objects that contain crystalline silica.

What are the hazards of crystalline silica?

Silica exposure remains a serious threat to nearly 2 million U.S. workers, including more than 100,000 workers in high risk jobs such as abrasive blasting, foundry work, stonecutting, rock drilling, quarry work and tunneling. The seriousness of the health hazards associated with silica exposure is demonstrated by the fatalities and disabling illnesses that continue to occur in sandblasters and rockdrillers. Crystalline silica has been classified as a human lung carcinogen. Additionally, breathing crystalline silica dust can cause **silicosis**, which in severe cases can be disabling, or even fatal. The respirable silica dust enters the lungs and causes the formation of scar tissue, thus reducing the lungs' ability to take in oxygen. There is no cure for silicosis. Since silicosis affects lung function, it makes one more susceptible to lung infections like **tuberculosis**. In addition, smoking causes lung damage and adds to the damage caused by breathing silica dust.

What are the symptoms of silicosis?

Silicosis is classified into three types: chronic/classic, accelerated, and acute.

Chronic/classic silicosis, the most common, occurs after 15–20 years of moderate to low exposures to respirable crystalline silica. Symptoms associated with chronic silicosis may or may not be obvious; therefore, workers need to have a chest x-ray to determine if there is lung damage. As the disease progresses, the worker may experience shortness of breath upon exercising and have clinical signs of poor oxygen/carbon dioxide exchange. In the later stages, the worker may experience fatigue, extreme shortness of breath, chest pain, or respiratory failure.

Accelerated silicosis can occur after 5–10 years of high exposures to respirable crystalline silica. Symptoms include severe shortness of breath, weakness, and weight loss. The onset of symptoms takes longer than in acute silicosis.

Acute silicosis occurs after a few months or as long as 2 years following exposures to extremely high concentrations of respirable crystalline silica. Symptoms of acute silicosis include severe disabling shortness of breath, weakness, and weight loss, which often leads to death.

Where are construction workers exposed to crystalline silica?

Exposure occurs during many different construction activities. The most severe exposures generally occur during abrasive blasting with sand to remove paint and rust from bridges, tanks, concrete structures, and other surfaces. Other construction activities that may result in severe exposure include: jack hammering, rock/well drilling, concrete mixing, concrete drilling, brick and concrete block cutting and sawing, tuck pointing, tunneling operations.

Where are general industry employees exposed to crystalline silica dust?

The most severe exposures to crystalline silica result from abrasive blasting, which is done to clean and smooth irregularities from molds, jewelry, and foundry castings, finish tombstones, etch or frost glass, or remove paint, oils, rust, or dirt form objects needing to be repainted or treated. Other exposures to silica dust occur in cement and brick manufacturing, asphalt pavement manufacturing, china and ceramic manufacturing and the tool and die, steel and foundry industries. Crystalline silica is used in manufacturing, household abrasives, adhesives, paints, soaps, and glass. Additionally, crystalline silica exposures occur in the maintenance, repair and replacement of refractory brick furnace linings.

In the maritime industry, shipyard employees are exposed to silica primarily in abrasive blasting operations to remove paint and clean and prepare steel hulls, bulkheads, decks, and tanks for paints and coatings.

How is OSHA addressing exposure to crystalline silica?

OSHA has an established Permissible Exposure Limit, or PEL, which is the maximum amount of crystalline silica to which workers may be exposed during an 8-hour work shift (29 *CFR* 1926.55, 1910.1000). OSHA also requires hazard

communication training for workers exposed to crystalline silica, and requires a repirator protection program until engineering controls are implemented. Additionally, OSHA has a National Emphasis Program (NEP) for Crystalline Silica exposure to identify, reduce, and eliminate health hazards associated with occupational exposures.

What can employers/employees do to protect against exposures to crystalline silica?

- Replace crystalline silica materials with safer substitutes, whenever possible.
- Provide engineering or administrative controls, where feasible, such as local exhaust ventilation, and blasting cabinets. Where necessary to reduce exposures below the PEL, use protective equipment or other protective measures.
- Use all available work practices to control dust exposures, such as water sprays.
- Wear only a N95 NIOSH certified respirator, if respirator protection is required. Do not alter the respirator. Do not wear a tight-fitting respirator with a beard or mustache that prevents a good seal between the respirator and the face.
- Wear only a Type CE abrasive-blast supplied-air respirator for abrasive blasting.
- Wear disposable or washable work clothes and shower if facilities are available. Vacuum the dust from your clothes or change into clean clothing before leaving the work site.
- Participate in training, exposure monitoring, and health screening and surveillance programs to monitor any adverse health effects caused by crystalline silica exposures.
- Be aware of the operations and job tasks creating crystalline silica exposures in your workplace environment and know how to protect yourself.
- Be aware of the health hazards related to exposures to crystalline silica. Smoking adds to the lung damage caused by silica exposures.
- Do not eat, drink, smoke, or apply cosmetics in areas where crystalline silica dust is present. Wash your hands and face outside of dusty areas before performing any of these activities.
- Remember: If it's silica, it's not just dust.

How can I get more information on safety and health?

OSHA has various publications, standards, technical assistance, and compliance tools to help you, and offers extensive assistance through workplace consultation, voluntary protection programs, strategic partnerships, alliances, state plans, grants, training, and education. OSHA's *Safety and Health Program Management Guidelines* (*Federal Register* 54:3904-3916, January 26, 1989) detail elements critical to the development of a successful safety and health management system. This and other information are available on OSHA's website.

- For one free copy of OSHA publications, send a self-addressed mailing label to OSHA Publications Office, 200 Constitution Avenue N.W., N-3101, Washington, DC 20210; or send a request to our fax at (202) 693-2498, or call us toll-free at (800) 321-OSHA.
- To order OSHA publications online at **www.osha.gov**, go to **Publications** and follow the instructions for ordering.
- To file a complaint by phone, report an emergency, or get OSHA advice, assistance, or products, contact your nearest OSHA office under the U.S. Department of Labor listing in your phone book, or call toll-free at **(800) 321-OSHA (6742)**. The teletypewriter (TTY) number is (877) 889-5627.
- To file a complaint online or obtain more information on OSHA federal and state programs, visit OSHA's website.

This is one in a series of informational fact sheets highlighting OSHA programs, policies, or standards. It does not impose any new compliance requirements. For a comprehensive list of compliance requirements of OSHA standards or regulations, refer to *Title 29 of the Code of Federal Regulations.* This information will be made available to sensory-impaired individuals upon request. The voice phone is (202) 693-1999. See also OSHA's website at **www.osha.gov**.

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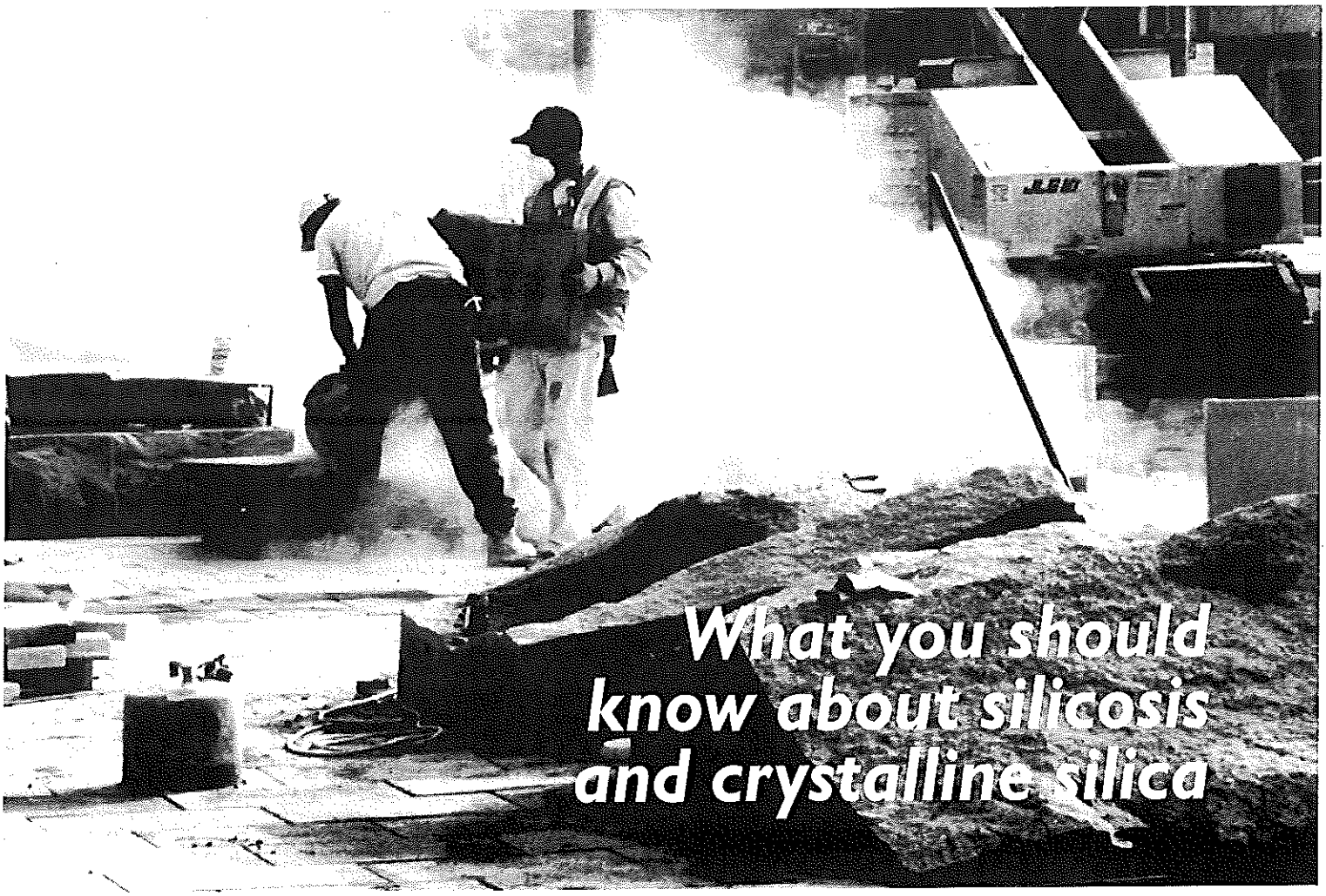
OSHA
Occupational Safety and Health Administration
U.S. Department of Labor
2002

IT'S NOT JUST DUST!



Oregon
OSHA

In compliance with the *Americans With Disabilities Act* (ADA), this publication is available in alternative formats. Call the Oregon OSHA public relations manager, 503-378-3272 (V/TTY).

Cover Photo: Sampling showed this masonry contractor, working with concrete block, was overexposed. (**Photo:** Tim Capley, Oregon OSHA, Medford)

Contents

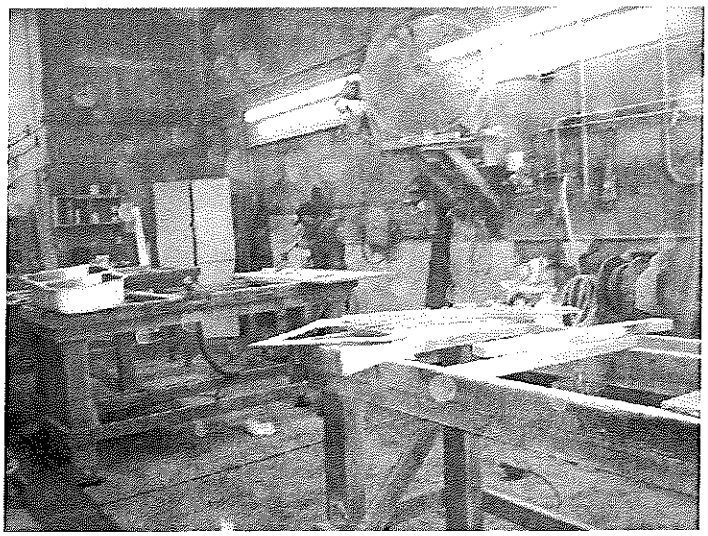
Introduction

Silicosis is an occupational disease caused by exposure to dust containing crystalline silica, one of the most common minerals on our planet.

Silicosis isn't curable — sadly, workers still die from the disease — but it is preventable. The keys to prevention are straightforward: Identify workplace activities that produce crystalline silica dust and then eliminate the dust or control it so that workers aren't exposed.

You may be using products or materials that contain crystalline silica and not even know it. If your workplace is a dusty one or if you work with materials that produce dust, you should be concerned about silicosis and crystalline silica hazards.

We want to advance and improve workplace safety and health for all working Oregonians. One way to do that is to inform you about workplace hazards you can control — and crystalline silica is one of those hazards. This guide will help you learn about silicosis, what causes it, and how to prevent it.



What is silicosis?

Silicosis is a progressive, disabling lung disease caused by breathing dust containing particles of crystalline silica — particles so small you can see them only with a microscope. The cause of silicosis has been known for centuries — the earliest cases of silicosis were recorded before the first century — yet workers continue to die every year from the disease. Crystalline silica exists almost everywhere in our natural environment. It's abundant in soil, sand, dust, quartz, and granite rock. Not surprisingly, crystalline silica also exists in products that we make or use every day at home and at work. For example, china tableware is made from materials containing silica flour, which is finely ground quartz. And unwashed root vegetables like potatoes are coated with soil containing crystalline silica — a possible health hazard for those who harvest, sort, and bag them without appropriate exposure controls.

Keep in mind that crystalline silica can cause silicosis only when we breathe it into our lungs as dust or a fine powder. Here's what happens: The silica particles become trapped in the lungs and damage the tissue. As a result, the lung tissue scars and forms small, rounded masses called nodules. Over time, the nodules grow, making breathing increasingly difficult.

Though silicosis shows no symptoms at first, the victim eventually has trouble breathing and develops a severe cough. Other symptoms include fatigue, loss of appetite, chest pains, and fever. Only a complete work history, a chest X-ray, and a lung-function test will determine whether or not a worker has the disease. Those who think they may have silicosis should see a medical doctor who specializes in occupational medicine.

Chronic silicosis

Silicosis can affect you in three ways. Most workers who get silicosis don't show any symptoms for 10 or more years. That's because their exposures to crystalline silica are fairly low, but frequent. They develop a condition called chronic silicosis.

Accelerated silicosis

As exposure levels increase, silicosis symptoms can appear much earlier. For example, those diagnosed with accelerated silicosis show symptoms within five to 10 years.

Acute silicosis

Workers exposed to extremely high levels of crystalline silica dust may develop acute silicosis, a condition that can show symptoms within only a few weeks of an initial exposure. Acute silicosis is most common among sand blasters because of the high levels of silica dust they breathe.

About crystalline silica

What is it?

Crystalline silica is the scientific name for a group of *minerals* containing silicon and oxygen. *Crystalline* means that the oxygen and silicon atoms are arranged in a specific pattern.

Forms of crystalline silica

Crystalline silica exists in several forms, including *quartz, cristobalite,* and *tridymite.* Tridymite is the most potent, but least common, form. Cristobalite, which occurs naturally in volcanic rock, is often found with quartz in the Pacific Northwest. Of these forms, quartz is the most common; in fact, it's the second most common mineral on the planet. (Feldspar is most common.)

The cause of silicosis is linked to cancer

Crystalline silica causes silicosis, but it has also been linked to cancer. As a result, employees who use any products that contains more than 0.1 percent crystalline silica must follow the labeling, information, and training requirements of the *Hazard Communication Standard.*

Who should be concerned about silicosis?

Any worker exposed to dust containing crystalline silica — dust from crushed rock, soil, dirt, gravel, or sand, for example — should be concerned about silicosis. In fact, more than 100,000 workers in this country are exposed every year. The following table shows some of the activities that put them at risk.

Activities that could put workers at risk:

Manufacturing

- Metal casting
- Glass products
- Ceramics, clay, and pottery
- Asphalt paving material
- Cut stone and stone products
- Abrasives
- Paint and rubber products
- Filtered foods and beverages

Construction

- Chipping, hammering, and drilling rock
- Crushing, loading, hauling, and dumping rock
- Abrasive blasting
- Sawing, hammering, drilling, grinding, and chipping masonry, concrete, or fiber-cement siding
- Demolition of concrete or masonry structures
- Dry sweeping or using pressurized air to blow concrete, rock, or sand dust

Agriculture

- Onion harvesting, topping, sorting, grading, and bagging
- Potato harvesting, sorting, grading, washing, and bagging
- Sand used in agriculture chemicals

Because crystalline silica is such a common mineral — so prominent in the products that we make and use — you should be concerned about working with any material that contains more than 0.1 percent crystalline silica.

How do you prevent silicosis?

The best way to prevent silicosis is to identify workplace activities that produce crystalline silica dust and then to eliminate or control the dust.

Oregon OSHA has established an permissible exposure limit (PEL) to silica of 0.1 milligrams per cubic meter of air (mg/m^3) averaged over an 8-hour period. This limit is for the respirable fraction of the dust (particle sizes of 1 to 10 micrometers, or microns), and requires specialized collection equipment in order to accurately collect an air sample.

How to identify activities that produce crystalline silica dust

Do you know what activities at your workplace expose workers to crystalline silica dust? Suspect any activity that produces dust from rock, soil, dirt, gravel, sand, or any product made from these materials.

If you haven't done so, make a list of the suspect activities.

A key term

The permissible exposure limit (PEL) is the maximum amount of airborne crystalline silica dust that one can be exposed to during a full work shift.

Then, determine which of those activities puts workers at risk. An industrial hygienist can help you make that determination by sampling the air workers breathe.

How to eliminate or control crystalline silica dust

Once you've identified activities that expose workers to hazardous levels of crystalline silica, you need to eliminate the exposure or control it so that it isn't hazardous. How can you eliminate or control crystalline silica exposures at your workplace? Here are some suggestions:

- **Use substitutes.** The best way to eliminate exposure is to use materials that don't contain crystalline silica. This is an "engineering" approach to hazard control. With an engineering approach, you eliminate hazards by selecting tools and equipment and by designing work processes that are hazard free. Materials that don't expose workers to crystalline silica include the following:
  - aluminum oxide
  - aluminum shot
  - ambient polycarbonate
  - apricot pits
  - corn cobs
  - cryogenic polycarbonate
  - emery
  - garnet
  - glass beads
  - melamine plastic
  - novaculite
  - polycarbonate
  - silicon carbide
  - stainless cast shot
  - stainless cut wire
  - steel grit
  - steel shot
  - urea plastic
  - walnut shells
  - wheat grain
  - white aluminum oxide
  - zircon
- **Use dust-containment systems.** Other ways to eliminate exposure include installing dust-collection systems on machines that generate dust or using enclosed cabinets with gloved armholes to do hazardous tasks.
- **Work wet.** Use wet drilling or sawing to control dust. Remove dust and debris with a wet vacuum or hose it down, rather than blowing it around with compressed air or dry-sweeping it.
- **Ventilate.** Use local-exhaust ventilation systems to keep work areas dust free.
- **Use personal protective equipment when necessary.** Personal protective equipment can protect workers from hazards, but it doesn't eliminate hazards. If the equipment fails, or it's not appropriate for a particular task, a worker can still be exposed.

  Respirators are a special type of personal protective equipment. When carefully selected, worn, and used, respirators will protect workers from inhaling crystalline silica dust. But you should use a respirator only if you can't eliminate or control the dust with any other method, and you need to understand the requirements for using respirators. Don't use a respirator as your only means of protection!

- **Monitor the air and workers' health.** Air monitoring is a method of determining workers' exposures to silica dust. Air monitoring results can also help you decide the most appropriate methods for controlling crystalline silica dust.

  Workers who may be exposed to crystalline silica dust should have regular medical exams. They should be examined before they begin their jobs and at least every three years thereafter. Examinations should include medical and work histories, chest X-rays, and tuberculosis evaluations. Medical examinations should supplement air monitoring and other control methods — not replace them.

- **Practice good personal hygiene.** Those who work with materials containing crystalline silica should wash their hands before eating, drinking, or smoking. They should shower, if possible, and change into clean clothes before leaving the worksite. They should never eat, drink, or use tobacco in abrasive blasting areas.
- **Train.** Make sure workers know about silicosis, silica-dust hazards, and how to control their exposure. Their training should cover the following:
  - The health effects of exposure to crystalline silica.
  - The importance of effective controls, safe work practices, and personal hygiene.
  - How to use Safety Data Sheets – formerly known as "Material Safety Data Sheets" (MSDS) – for silica, masonry products, and abrasives.
  - The purpose of boundaries or signs that identify work areas containing crystalline silica dust.
  - How to safely handle, label, and store hazardous materials.
  - How to use and care for personal protective equipment.

Guidelines for preventing silicosis

- Identify work areas, tasks, and equipment that expose workers to crystalline silica dust.
- Use materials that don't produce crystalline silica.
- Work wet and use dust-containment systems to control dust.
- Ventilate to keep work areas dust free.
- Use personal protective equipment when necessary. (See the respiratory protection standard for more information on using respirators properly.)
- Monitor the air to determine worker exposure levels.
- Give exposed workers regular medical exams.
- Practice good personal hygiene.
- Educate workers about silica-dust hazards and silicosis; train them how to control their exposure.
- Label products that contain crystalline silica.

- **Communicate.** Make sure any product that contains silica has a label that says so. Products that contain more than 0.1 percent crystalline silica must have Safety Data Sheets.
- **Post warning signs.** Put up signs that identify work areas, tasks, and equipment that may expose workers to crystalline silica. The signs should warn workers about crystalline-silica hazards and identify required personal protective equipment.

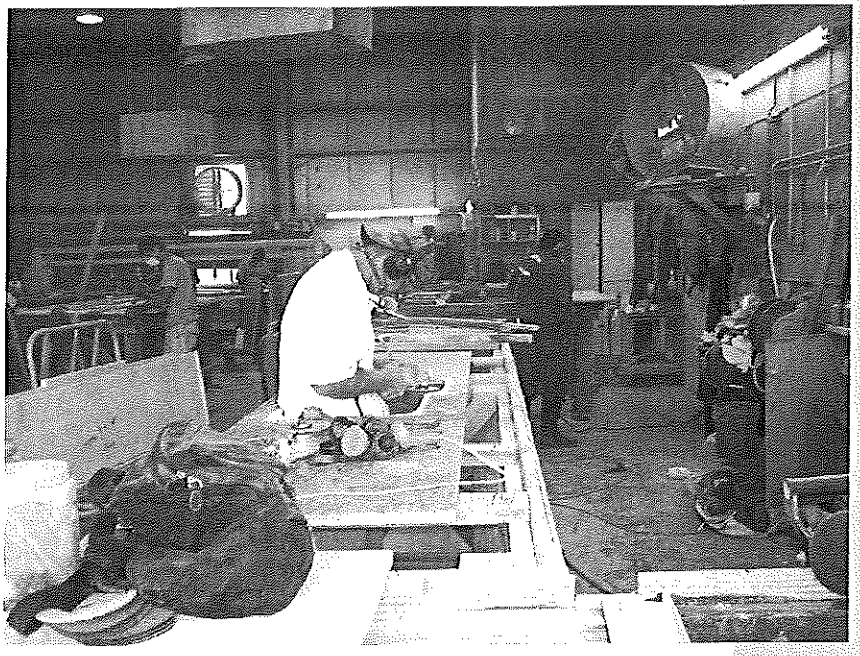
I'm an employer. What do I do if an employee is overexposed to crystalline silica?

The first thing you should do is tell the employee. You should also make sure the employee gets a medical examination from an occupational medical doctor.

Then, eliminate the exposure. If you can't do that, you'll need to control it to prevent overexposure by doing one or more of the following:

- Use a silica substitute
- Use engineering controls
- Improve work practices
- Use personal protective equipment

Also, review *How do you prevent silicosis?* (Page 4).

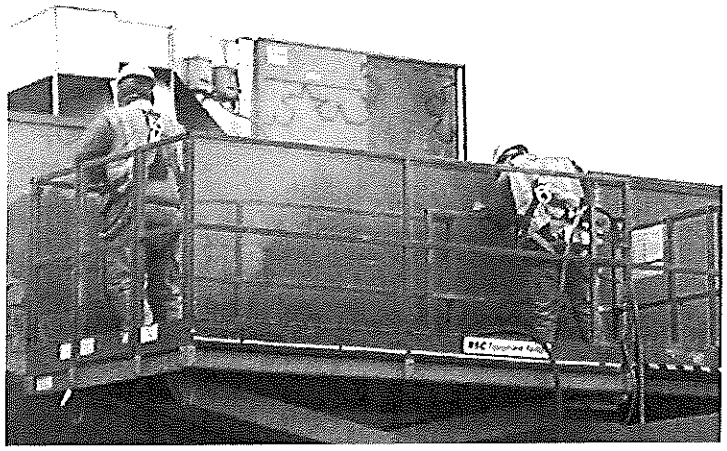


Getting help

The following sources offer more information about how to protect yourself, your co-workers, and your employees from silicosis.

- **Your insurance carrier** offers on-site safety and health consultations including air sampling and air monitoring. Contact your carrier to request a consultation.
- **Oregon OSHA** offers no-charge, on-site workplace consultations, full-service safety and health training, a video-lending library, and information online. To contact us, see the back page of this publication.
- **Information on the World Wide Web**

• National Institute for Occupational Safety and Health (NIOSH)	**www.cdc.gov/niosh**
• Occupational Safety and Health Administration (OSHA)	**www.osha.gov**
• Mine Safety and Health Administration (MSHA)	**www.msha.gov**
• The Center to Protect Workers' Rights (CPWR)	**www.cpwr.com**



Key terms

Accelerated silicosis	A form of silicosis that shows symptoms within five to 10 years.
Acute silicosis	A form of silicosis that develops in workers exposed to very high levels of crystalline silica. Symptoms may appear within a few weeks of an initial exposure.
Chronic silicosis	The most common form of silicosis. Workers usually don't show symptoms for 10 years or more after an initial exposure.
Cristobalite	A form of crystalline silica that is stable at the highest temperature. It occurs naturally in volcanic rock.
Crystalline	Having a very structured molecular arrangement.
Exposure control	A means of eliminating or reducing workplace hazards. Examples include engineering, work-practice, and administrative controls.
Free crystalline silica	Pure crystalline silica that is chemically uncombined.
Hazard Communication Standard	Ensures that chemical hazards are properly evaluated and that employers and their employees understand the hazards. Requirements focus on proper labeling, Safety Data Sheets, and training.
Industrial hygienist	A health professional trained to recognize, evaluate, and develop controls for occupational health hazards.
Mineral	Naturally occurring crystalline solids, usually made from oxygen, silicon, sulfur, and any of six common metals or metal compounds.
Permissible exposure limit (PEL)	The maximum amount of airborne crystalline silica dust that one can be exposed to during a full work shift.
Quartz	The most common type of crystalline silica.
Respirable dust	Dust that contains particles small enough (about 3.5 microns) to enter the gas-exchange region of the human lung.
Respiratory Protection Standard	Identifies what employers must do to ensure their employees use respirators safely and responsibly.
Safety Data Sheet (SDS)	Printed material that describes a hazardous chemical in accordance with the Hazard Communication Standard. *Formerly known as Material Safety Data Sheet (MSDS).*
Silicosis	A disease that results from exposure to high levels of respirable silica dust and characterized by scarred lung tissue.
Tridymite	A form of crystalline silica found in volcanic rocks and in fired silica bricks.

Applicable rules:

Air Contaminates:

- General Industry 437-002-0382
- Construction 437-003-1000
- Agriculture 437-004-9000

Hazard Communication:

- General Industry 1910.1200
- Construction 1926.59
- Agriculture 437-004-9800

Respiratory Protection:

- General Industry 1910.134
- Construction 1926.103
- Agriculture 437-004-1041

Notes:

*Oregon*OSHA Services

Oregon OSHA offers a wide variety of safety and health services to employers and employees:

Appeals

503-947-7426; 800-922-2689; admin.web@state.or.us

- Provides the opportunity for employers to hold informal meetings with Oregon OSHA on concerns about workplace safety and health.
- Discusses Oregon OSHA's requirements and clarifies workplace
- Discusses abatement dates and negotiates settlement agreements to resolve disputed citations.

Conferences

503-378-3272; 888-292-5247, Option 1; oregon.conferences@state.or.us

- Co-hosts conferences throughout Oregon that enable employees and employers to learn and share ideas with local and nationally recognized safety and health professionals.

Consultative Services

503-378-3272; 800-922-2689; consult.web@state.or.us

- Offers no-cost, on-site safety and health assistance to help Oregon employers recognize and correct workplace safety and health problems.
- Provides consultations in the areas of safety, industrial hygiene, ergonomics, occupational safety and health programs, assistance to new businesses, the Safety and Health Achievement Recognition Program (SHARP), and the Voluntary Protection Program (VPP).

Enforcement

503-378-3272; 800-922-2689; enforce.web@state.or.us

- Offers pre-job conferences for mobile employers in industries such as logging and construction.
- Inspects places of employment for occupational safety and health hazards and investigates workplace complaints and accidents.
- Provides abatement assistance to employers who have received citations and provides compliance and technical assistance by phone.

Public Education

503-947-7443; 888-292-5247, Option 2; ed.web@state.or.us

- Provides workshops and materials covering management of basic safety and health programs, safety committees, accident investigation, technical topics, and job safety analysis.

Standards and Technical Resources

503-378-3272; 800-922-2689; tech.web@state.or.us

- Develops, interprets, and gives technical advice on Oregon OSHA's safety and health rules.
- Publishes safe-practices guides, pamphlets, and other materials for employers and employees
- Manages the Oregon OSHA Resource Center, which offers safety videos, books, periodicals, and research assistance for employers and employees.

Need more information? Call your nearest Oregon OSHA office.

Salem Central Office
350 Winter St. NE, Rm. 430
Salem, OR 97301-3882

Phone: 503-378-3272
Toll-free: 800-922-2689
Fax: 503-947-7461
en Español: 800-843-8086
Web site: www.orosha.org

Bend
Red Oaks Square
1230 NE Third St., Ste. A-115
Bend, OR 97701-4374
541-388-6066
Consultation: 541-388-6068

Eugene
1140 Willagillespie, Ste. 42
Eugene, OR 97401-2101
541-686-7562
Consultation: 541-686-7913

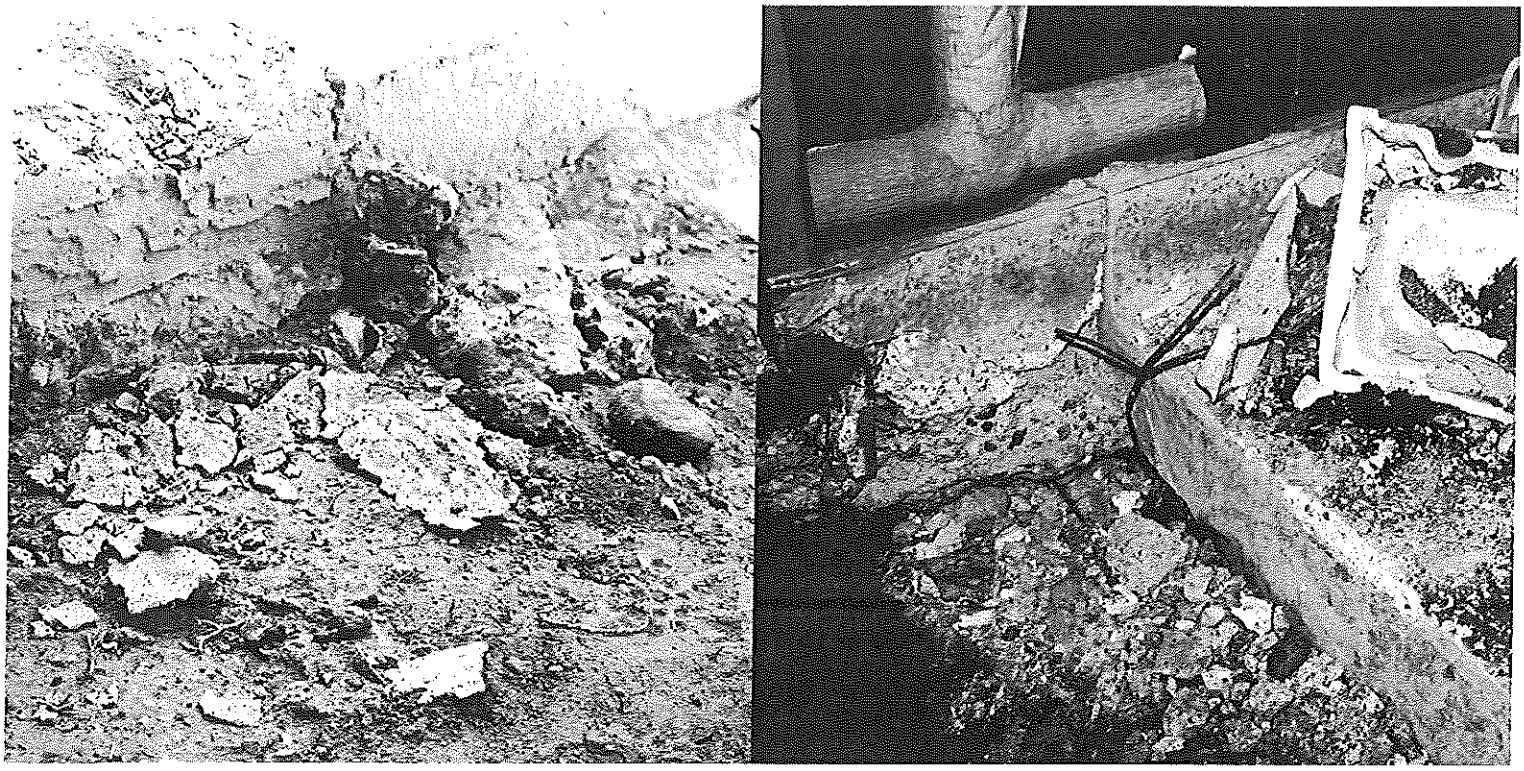
Medford
1840 Barnett Road, Ste. D
Medford, OR 97504-8250
541-776-6030
Consultation: 541-776-6016

Pendleton
200 SE Hailey Ave.
Pendleton, OR 97801-3056
541-276-9175
Consultation: 541-276-2353

Portland
1750 NW Naito Parkway, Ste. 112
Portland, OR 97209-2533
503-229-5910
Consultation: 503-229-6193

Salem
1340 Tandem Ave. NE, Ste. 160
Salem, OR 97301
503-378-3274
Consultation: 503-373-7819

Visit us at www.orosha.org



DEPARTMENT OF CONSUMER & BUSINESS SERVICES

Oregon OSHA

440-3301 (6/12)

EXHIBIT F

Silica, Crystalline (Respirable Size)

CAS No.: none assigned

Known to be a human carcinogen

First listed in the *Sixth Annual Report on Carcinogens* (1991)

Also known as crystalline silicon dioxide

Carcinogenicity

Respirable crystalline silica, primarily quartz dusts occurring in industrial and occupational settings, is *known to be a human carcinogen* based on sufficient evidence of carcinogenicity from studies in humans. Respirable crystalline silica was first listed in the *Sixth Annual Report on Carcinogens* in 1991 as *reasonably anticipated to be a human carcinogen* based on sufficient evidence of carcinogenicity from studies in experimental animals; the listing was revised to *known to be a human carcinogen* in the *Ninth Report on Carcinogens* in 2000.

Cancer Studies in Humans

Exposure of workers to respirable crystalline silica is associated with elevated rates of lung cancer. The link between human lung cancer and exposure to respirable crystalline silica was strongest in studies of quarry and granite workers and workers involved in ceramic, pottery, refractory brick, and diatomaceous earth industries. Human cancer risks are associated with exposure to respirable quartz and cristobalite but not to amorphous silica. The overall relative risk is approximately 1.3 to 1.5, with higher risks found in groups with greater exposure or longer time since first exposure. Silicosis, a marker for exposure to silica dust, is associated with elevated lung cancer rates, with relative risks of 2.0 to 4.0. Elevated risks have been seen in studies that accounted for smoking or asbestos exposure, and confounding by co-exposure is unlikely to explain these results (IARC 1997).

Cancer Studies in Experimental Animals

In rats, exposure to various forms of respirable crystalline silica by inhalation or intratracheal instillation consistently caused lung cancer (adenocarcinoma or squamous-cell carcinoma). Single intrapleural or intraperitoneal injections of various forms of respirable crystalline silica also caused lymphoma in rats (IARC 1997).

Studies on Mechanisms of Carcinogenesis

Respirable crystalline silica deposited in the lungs causes epithelial injury and macrophage activation, leading to inflammatory responses and proliferation of the epithelial and interstitial cells. In humans, respirable crystalline silica persists in the lungs, culminating in the development of chronic silicosis, emphysema, obstructive airway disease, and lymph-node fibrosis. Respirable crystalline silica stimulates (1) release of cytokines and growth factors from macrophages and epithelial cells, (2) release of reactive oxygen and nitrogen intermediates, and (3) oxidative stress in the lungs. All of these pathways contribute to lung disease. Marked and persistent inflammation, specifically inflammatory-cell-derived oxidants, may provide a mechanism by which respirable crystalline silica exposure can result in genetic damage in the lung parenchyma. In one study, human subjects exposed to respirable crystalline silica showed increases in sister chromatid exchange and chromosomal aberrations in peripheral blood lymphocytes. Most cellular genotoxicity studies with quartz gave negative results; however, *in vitro* exposure to some quartz samples caused micronucleus formation or cell transformation in several cell types, including Syrian hamster embryo cells, Chinese hamster lung cells, and human embryonic lung cells (IARC 1997).

Properties

Silica (SiO_2) is a group IV metal oxide that exists as colorless or white trigonal crystals and has a molecular weight of 60.1. It occurs naturally in crystalline and amorphous forms, and the specific gravity and melting point both depend on the crystalline form. The basic structural units of the silica mineral are silicon tetrahedra (SiO_4). Slight variations in the orientation of the tetrahedra result in the different polymorphs of silica; crystalline silica has seven polymorphs. In crystalline silica, silicon and oxygen atoms are arranged in definite regular patterns throughout (Parmeggiani 1983).

Quartz, cristobalite, and tridymite are the three most common crystalline forms of free silica (USBM 1992). Quartz is by far the most common; it is found abundantly in most rock types, including granites and quartzites, and in sands and soils. Cristobalite and tridymite are found in volcanic rocks. All three forms are interrelated and may change their form under different temperature and pressure conditions. The structure of quartz is more compact than that of tridymite or cristobalite (IARC 1987, 1997). Quartz melts to a glass, and its coefficient of expansion by heat is the lowest of any known substance. Silica is practically insoluble in water at 20°C and in most acids; but its solubility increases with temperature and pH and is affected by the presence of trace metals. The rate of solubility also is affected by particle size, and the external amorphous layer in quartz is more soluble than the crystalline underlying core. Silica dissolves readily in hydrofluoric acid, producing silicon tetrafluoride gas (Merck 1989, IARC 1997).

Use

Because of its unique physical and chemical properties, crystalline silica has many uses. Commercially produced silica products include quartzite, tripoli, ganister, chert, and novaculite. Crystalline silica also occurs in nature as agate, amethyst, chalcedony, cristobalite, flint, quartz, tridymite, and, in its most common form, sand (IARC 1997). Naturally occurring silica materials are classified by end use or industry. Sand and gravel are produced almost exclusively for road building and concrete construction, depending on particle size and shape, surface texture, and porosity (IARC 1987).

Silica sand deposits, commonly quartz or derived from quartz, typically have a silica content of 95%; however, impurities may be present at up to 25%. Silica sand has been used for many different purposes over many years. In some instances, grinding of sand or gravel is required, increasing the levels of dust containing respirable crystalline silica. Sand with low iron content and more than 98% silica is used in the manufacture of glass and ceramics. Silica sand also is used in foundry castings, in abrasives (such as sandpaper and grinding and polishing agents), in sandblasting materials, in hydraulic fracturing to increase rock permeability to increase oil and gas recovery, as a raw material for the production of silicon and ferrosilicon metals, and as a filter for large volumes of water, such as in municipal water and sewage treatment plants (IARC 1997).

Extremely fine grades of silica sand products are known as flours. Silica flour, not always labeled as containing crystalline silica and often mislabeled as amorphous silica, is used industrially as abrasive cleaners and inert fillers. Silica flour may be used in toothpaste, scouring powders, metal polishes, paints, rubber, paper, plastics, wood fillers, cements, road surfacing materials, and foundry applications (NIOSH 1981). Cristobalite is a major component of refractory silica bricks; the high temperatures at which the bricks are fired convert the quartz mainly to cristobalite (IARC 1997).

Production

Silica used in commercial products is obtained mainly from natural sources (IARC 1997). U.S. production of silica sand (industrial sand and gravel combined) was estimated at 28.5 million metric tons (62.7 billion pounds) in 1997 and 27.9 million metric tons (61.4 billion pounds) in 2001 (Dolley 2008). U.S. production of high-purity quartz was 315,000 lb in 1979, decreasing to 174,000 lb in 1981, and rising to 800,000 lb in 1983 (IARC 1987). Natural quartz crystals are no longer mined in the United States. Synthetic quartz crystals (hypothermally cultured quartz crystals) now are used as the raw material for quartz production. The precursor material for synthetic quartz crystals is lasca (high-purity quartz dust), which was mined in the United States for many years; however, U.S. mining and processing of lasca ended in 1997. Lasca mining production was estimated at 1 million pounds in 1985 and 600,000 lb in 1988. In 2009, three U.S. firms produced cultured quartz crystals from imported and stockpiled lasca. No data on U.S. imports or exports of quartz crystal (industrial) were reported in 2009. Quartz-crystal import and export quantities and values reported in previous years included zirconia that was inadvertently reported as quartz crystal (Dolley 2009).

Exposure

Crystalline silica is an abundant and commonly found natural material. Human exposure to respirable crystalline silica, primarily quartz dust, occurs mainly in industrial and occupational settings. Nonoccupational exposure to respirable crystalline silica results from natural processes and anthropogenic sources; silica is a common air contaminant. Residents near quarries and sand and gravel operations potentially are exposed to respirable crystalline silica. A major source of cristobalite and tridymite in the United States is volcanic rock in California and Colorado (NIOSH 1986). Local conditions, especially in deserts and areas around recent volcanic eruptions and mine dumps, can give rise to silica-containing dust (IARC 1987).

Consumers may be exposed to respirable crystalline silica from abrasives, sand paper, detergent, grouts, and concrete (IARC 1997). Crystalline silica may also be an unintentional contaminant; for example, diatomaceous earth, used as a filler in reconstituted tobacco sheets, may be converted to cristobalite as it passes through the burning tip of tobacco products (IARC 1987).

Respirable quartz levels exceeding 0.1 mg/m^3 are most frequently found in metal, nonmetal, and coal mines and mills, granite quarrying and processing, crushed-stone and related industries, foundries, the ceramics industry, construction, and sandblasting operations (IARC 1997). The National Occupational Hazard Survey (conducted from 1972 to 1974) estimated that 81,221 workers potentially were exposed to quartz (NIOSH 1976). The National Occupational Exposure Survey (conducted from 1981 to 1983) estimated that 944,731 workers, including 112,888 women, potentially were exposed to quartz and that 31,369 workers, including 2,228 women, potentially were exposed to cristobalite (NIOSH 1990). The National Institute for Occupational Safety and Health (NIOSH 2002) estimated that 522,748 workers in nonmining industries and 722,708 workers in mining industries potentially were exposed to respirable crystalline silica in 1986.

Potential exposure to respirable crystalline silica has been studied in metal and nonmetal mining and milling operations. Workers in sandstone, clay, shale, and miscellaneous nonmetallic mineral mills had the highest exposure to silica dust. Within the mills, the workers with the highest exposure were baggers, general laborers, and personnel involved in the crushing, grinding, and sizing operations. Workers in the granite and stone industry and in construction also are potentially exposed to respirable crystalline silica. Potential exposure was highest for sculptors and carvers, stencil cutters, polishers, and sandblasters; for these occupationas, the silica content of respirable dust ranged from 4.8% to 12.2%. Concentrations of respirable crystalline silica ranged from 0.01 to 0.20 mg/m^3 in clay-pipe factories and from 0 to 0.18 mg/m^3 in a plant producing ceramic electronic equipment parts. Silica concentrations of at least twice the permissible exposure limit were found in 10% of 348 air samples collected from glass-manufacturing industries and 23% to 26% of samples from clay-products and pottery industries. One third of samples from fibrous-glass plants had concentrations of respirable crystalline silica in excess of 0.10 mg/m^3, and 23% of samples collected in iron and steel foundries had concentrations in excess of 0.20 mg/m^3 (IARC 1987). Occupational exposure to cristobalite may occur in industries where silica products are heated, including refractory brick and diatomaceous earth plants and ceramic and pottery manufacturing plants (IARC 1997).

Regulations

Mine Safety and Health Administration

Silica sand or other materials containing more than 1% free silica shall not be used as an abrasive substance in abrasive blasting in underground areas and underground mines.

Occupational Safety and Health Administration (OSHA)

While this section accurately identifies OSHA's legally enforceable PELs for this substance in 2010, specific PELs may not reflect the more current studies and may not adequately protect workers.

Permissible exposure limit (PEL) = 250 mppcf/(%SiO_2 +5), 10 mg/m^3/(%SiO_2 + 2) for crystalline quartz (respirable); = 30 mg/m^3/(%SiO_2 + 2) for quartz (total); = one half the value calculated from the count or mass formula for quartz for cristobalite and tridymite (mppcf = millions of particles per cubic foot).

Guidelines

American Conference of Governmental Industrial Hygienists (ACGIH)

Threshold limit value – time-weighted average (TLV-TWA) = 0.025 mg/m^3 (respirable fraction).

National Institute for Occupational Safety and Health (NIOSH)

Recommended exposure limit (REL) = 0.05 mg/m^3.

Immediately dangerous to life and health (IDLH) limit = 25 mg/m^3 for cristobalite, tridymite; = 50 mg/m^3 for quartz, tripoli.

Listed as a potential occupational carcinogen.

References

Dolley TP. 2008. *2008 Minerals Yearbook: Silica [Advance Release]*. U.S. Geological Survey. http://minerals.usgs.gov/minerals/pubs/commodity/silica/myb1-2008-silic.pdf.

Dolley TP. 2009. Quartz crystal (industrial). In *Mineral Commodity Summaries 2009*. U.S. Geological Survey. http://minerals.usgs.gov/minerals/pubs/commodity/silica/mcs-2009-quart.pdf.

IARC. 1987. *Silica and Some Silicates*. IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Humans, vol. 42. Lyon, France: International Agency for Research on Cancer. 289 pp.

IARC. 1997. Silica. In *Silica, Some Silicates, Coal Dust and Para-Armid Fibrils*. IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Humans, vol. 68. Lyon, France: International Agency for Research on Cancer. pp. 41-242.

Merck. 1989. *The Merck Index*, 11th ed. Rahway, NJ: Merck & Company.

NIOSH. 1976. *National Occupational Hazard Survey (1972-74)*. DHEW (NIOSH) Publication No. 78-114. Cincinnati, OH: National Institute for Occupational Safety and Health.

NIOSH. 1981. *Current Intelligence Bulletin 36. Silica Flour: Silicosis (Crystalline Silica)*. National Institute for Occupational Safety and Health. http://www.cdc.gov/niosh/81137_36.html.

NIOSH. 1986. *Occupational Respiratory Diseases*. Department of Health and Human Services. http://www.cdc.gov/niosh/86-102.html.

NIOSH. 1990. *National Occupational Exposure Survey (1981-83)*. National Institute for Occupational Safety and Health. Last updated: 7/1/90. http://www.cdc.gov/noes/noes1/66495sic.html, http://www.cdc.gov/noes/noes1/t0624sic.html.

NIOSH. 2002. *Health Effects of Occupational Exposure to Respirable Crystalline Silica*. National Institute for Occupational Safety and Health. http://www.cdc.gov/niosh/docs/2002-129/pdfs/02-129.pdf.

Parmeggiani L, ed. 1983. *Encyclopedia of Occupational and Health Safety*, 3rd ed., vol. 2. Geneva, Switzerland: International Labour Organization.

USBM. 1992. *Crystalline Silica Primer*. U.S. Bureau of Mines. http://minerals.usgs.gov/minerals/pubs/commodity/silica/780292.pdf.

EXHIBIT G

WASHINGTON STATE DEPARTMENT OF ECOLOGY

Focus

Controlling Air Pollution
Aggregate Industry

Impact on Air pollution

The processes associated with the aggregate industry produce air pollution, primarily particulate matter. Sources of particulate air pollution are:

- **Sand and gravel operations:** Excavation, spoil disposal, rock cleaning, crushing operations and pile storage of sand and gravel. Additional pollution comes from vehicles moving the materials around the pit.
- **Concrete plants:** Filling of the cement silo and any drying mixing operations prior to adding water.

Health effects

Particulate matter less than 10 microns in diameter (PM_{10}) is a public health concern. Thousands of these tiny particles would fit on the period at the end of this sentence. Larger particulate matter is a nuisance and can settle on trees and houses.

Small particulate matter collects in the lungs. Tiny particles collect in the most remote portions of the lungs called alveoli -- the tiny air sacs where oxygen enters the blood stream. Once in your body, the tiny particulate matter can cause structural and chemical changes deep in the lungs. The small particles also act as carriers for other toxic and carcinogenic materials. Chronic diseases, such as emphysema, chronic bronchitis, cancer and cardiovascular complications of lung damage have been associated with exposure to fine particles.

Regulation of particulate matter

The federal government regulates particulate matter less than 10 microns in diameter as one of six major air pollutants for which health-based air quality standards have been set. State Law requires existing sources of air pollution to use reasonable available control technology (RACT) to control their emissions. Industries that produce "fugitive dust emissions" – dust that is incidental to operations and not controlled – must use reasonable precautions to prevent these emissions.

Though the Department of Ecology has not done a formal RACT analysis for the sand and gravel mining, or concrete industries, the following recommendations may help you reduce particulate pollution from your operations.

May 2001

Ecology is an equal-opportunity employer

94-121 (rev. 5-01)

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How to reduce pollution from aggregate industry operations

- **Gravel roads:** The travel of vehicles on gravel roads produces particulate pollution. Smaller and temporary operations can regularly spray the roads with water to reduce the dust level. The frequency of watering should be such that the roads are kept moist when traveled upon. Larger and more permanent operations may need to pave the onsite roads used for hauling and the storage areas for aggregate. The paved roads should be washed regularly.
- **Screening:** The sorting process for aggregate material also produces dust and other particulate matter. Applying pressurized spray washers or charged foggers to the screens and transfer points during operation decreases the release of dust.
- **Other sources of dust:** All areas that produce dust should also be sprayed with water regularly. Storage piles should be consolidated to minimize vehicle travel. During the handling of material, water should be applied to the storage piles. [Use landscaping, barriers, and fencing to reduce windblown dust.]
- **Additional measures:** Where maximum control from screening and crushing operations is needed, they can be enclosed in a building. The building should be kept under negative pressure and the air conveyed to a fabric filter to remove the dust.

If you have further questions about air quality, contact:

Greg Flibbert, Air Quality Program, Spokane (509) 456-3114

Bob Swackhammer, Air Quality Program, Yakima (509) 575-2804

Al Newman, Air Quality Program, Olympia (360) 407-6810

If you need this document in an alternative format, please call Tami Dahlgren at (360) 407-6830 (Voice) or (360) 407-6006 (TDD).