

Exposure Monitoring Report Summary EMRS 2

Cutting Fiber Cement Siding Indoors with a Panel Saw Equipped with Dust Collection System

IMPORTANT NOTICE

The exposure results presented in this report are only valid for the specific test conditions and equipment described herein. James Hardie cannot anticipate all possible conditions on a jobsite and makes no warranty that actual worker exposure results will duplicate the results presented herein. **Employers using this report for the purpose of complying with applicable laws remain responsible for ensuring that the conditions and results described in this report accurately characterize each employee's current exposures. It is the employer's responsibility to ensure that any equipment used to control silica dust is in good working order and employees are trained to use it according to the equipment manufacturer's instructions.**

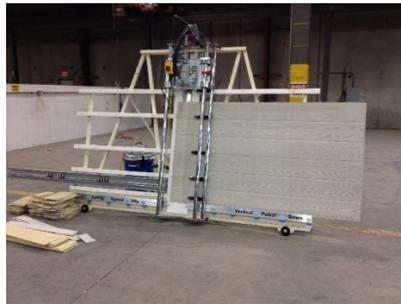
This report summarizes a monitoring study conducted by James Hardie to determine Respirable Crystalline Silica (RCS) dust exposure for a Cut Station Operator and dust concentrations in the immediate area where fiber cement siding (FCS) panels and planks were being cut indoors with panel saw equipped with dust collection systems (a.k.a., vacuums or local exhaust ventilation) to minimize breathing zone exposures to RCS. The purpose of the monitoring was to develop objective data¹ that may be used for compliance under the exposure assessment performance option of OSHA's RCS standard for Construction (29 CFR §1926.1153(d)(2)(ii)). Monitoring was conducted per NIOSH Method 7500 using a size-selective cyclone for Respirable Dust, with sample analysis conducted by a Laboratory Accredited by the American Industrial Hygiene Association.

Testing Conditions

A. Tools

- Safety Speed Model 6400 and 7000 Panel Saws equipped with a 7¼ in. 4-Tooth Polycrystalline Diamond (PCD) Tipped HardieBlade® saw blade, manufactured by Diablo and pictured below.

Model 6400 Panel Saw



Model 7000 Panel Saw



- Two HEPA (high-efficiency particulate air filter) vacuums were attached to the Panel Saws and pictured below:
 - A 2.25 HP, 11.0 amp HEPA vacuum with 2 in. hose was attached to the saw

¹ The term "objective data" means information, such as air monitoring data from industry-wide surveys or calculations based on the composition of a substance, demonstrating employee exposure to silica associated with a particular product or material or a specific process, task, or activity. The data must reflect workplace conditions closely resembling, or with a higher exposure potential than, the processes, types of material, control methods, work practices, and environmental conditions in the employer's current operations. Objective data reflecting "worst case" conditions, in particular, may be helpful in characterizing exposures for purposes of determining coverage under the standard.

From Occupational Exposure to Respirable Crystalline Silica 29 C.F.R. § 1910.1053; Frequently Asked Questions for General Industry; <https://www.osha.gov/dsg/topics/silicacrystalline/SilicaGeneralIndustryFAQs.pdf>

- A 1.0 HP, 7.5 amp HEPA vacuum with 2 in. hose was attached to the bottom of the cut channel

HEPA Vacuum Attached To Saw



HEPA Vacuum Attached To Cut Channel

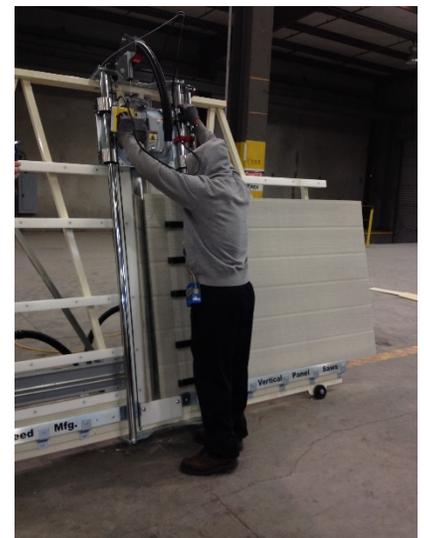


B. Weather (environmental conditions)

- All samples were collected inside to simulate scenarios of cutting panels and planks in manufactured housing factory settings

C. Other Conditions

- Panel Saws were used to cut James Hardie FCS products at 2 separate Cut Station Configurations.
- Mix of FCS panels (4 ft. X 9 ft. X 5/16 in.), planks (8 1/4 in. X 5/16 in.) and trim (8 1/4 in. X 5/16 in. simulated by using equivalent dimension of plank) was used and cut based on typical scenarios in manufactured housing settings
- In addition, each of the FCS products were cut in differing scenarios, including:
 - Single Cuts (used for the 4 ft. X 9 ft. X 5/16 in. panels)
 - Stacked Cuts (used for the 8 1/4 in. X 5/16 in. plank)
- An average of 50 single panel cuts, 100 stacked cuts and 125 simulated trim cuts were made each monitoring day to simulate manufactured housing settings
- Cutting durations (and monitoring periods) varied from approx. 278 to 433 minutes.



Results

Personal/Worker Samples

- 22 personal samples were collected, with 11 samples collected at each Panel Saw Cut Station.
- The results for the monitoring period were averaged and corrected to an 8-hour Time-Weighted Average (TWA) for comparison to the OSHA PEL of 50 micrograms of RCS per cubic meter of air (50 µg /m³).

Worker Exposure Based on Cutting Time and Panel Saw Model

Time Period	Panel Saw Model 6400	Panel Saw Model 7000
Monitoring Period (310-433 mins.)	Monitoring Period Result <7.6 µg/m ³ (avg. RCS concentration)	Monitoring Period Result <4.5 µg/m ³ (avg. RCS concentration)
If Monitoring Period Avg. Concentration is assumed for 8 hour TWA exposure ("worst-case")	<7.6 µg/m ³	<4.5 µg/m ³

95% Confidence Interval (95% CI) for 8-hour TWA exposure	<9.0 µg/m ³	<6.8 µg/m ³
2 hours (if cutting duration only 2 hours and balance of workday involved no additional RCS exposure)	<1.9 µg/m ³	<1.6 µg/m ³
4 hours (if cutting duration only 4 hours and balance of workday involved no additional RCS exposure)	<3.8 µg/m ³	<3.1 µg/m ³
6 hours (if cutting duration only 6 hours and balance of workday involved no additional RCS exposure)	<5.7 µg/m ³	<4.7 µg/m ³

- The personal exposures associated with the Model 6400 Panel Saw produced an avg. 8-hour TWA of <7.6 µg/m³ (95% CI= <9.0 µg/m³). All results collected on the saw operator were well below the OSHA PEL.
- The personal exposures associated with the Model 7000 Panel Saw produced an avg. 8-hour TWA of <4.5 µg/m³ (95% CI= <6.8 µg/m³). All results collected on the saw operator were well below the OSHA PEL.

Area Samples

- 32 Area samples were collected at a height approximating an average breathing zone height (i.e., approx. 5 ft. from the ground), with 11 samples collected approximately 20 ft. from each Panel Saw Cut Station and 10 samples collected at a location half-way between (and an avg. of 85 ft. from) the Panel Saw Cut Stations. The samples were collected over monitoring periods ranging from 311 to 432 minutes.
- All area sample results were below the analytical laboratory's Limit of Quantification, indicating no measurable concentrations of RCS were migrating from the Panel Saw Cut Stations at the distances sampled.

Formula for TWA

The **Permissible Exposure Limit (PEL)** is a legal limit for permissible exposure of an employee to RCS. OSHA requires an employer to keep employee exposures at or below the PEL of 50 µg/m³ or RCS calculated as an 8-hour TWA (29 CFR § 1926.1153(d)(1)). A TWA (Time-Weighted Average) is the average exposure workers have to RCS over an 8-hour work period. This means the exposure level as an 8-hour TWA is ≤50 µg/m³; and can be as high as ≤100 µg/m³ as a 4-hour TWA if assuming no exposure to RCS for the remainder of the shift. Further, the 2-hour TWA can be as high as ≤200 µg/m³ (assuming no exposure for the remainder of the shift) and a 1-hour TWA can be as high as ≤400 µg/m³ (assuming no exposure for the remainder of the shift).

Calculating the TWA: A TWA is equal to the sum of the various time periods in an 8-hour work day multiplied by the level of RCS dust exposure during each period, divided by the hours in the workday. Specifically,

$$\text{8-Hour TWA} = \frac{[t_1c_1 + t_2c_2 + \dots t_nc_n]}{8 \text{ hours}}$$

Where “t” represents the time for each period and “c” indicates the concentration of RCS exposure during that period in micrograms per cubic meter (µg/m³). For example...

An employee is exposed to RCS during 3 separate periods during an 8-hour work day. Period 1 was performed for 1 hour with an RCS exposure of 200 µg/m³; Period 2 was performed for 2 hours with an RCS exposure of 60 µg/m³; and Period 3 was performed for 1.5 hours with an RCS exposure of 40 µg/m³. The employee had no further RCS exposure for the remaining 3.5 hours of his shift.

$$\text{8-hour TWA} = \frac{[(1 \text{ hour})(200 \mu\text{g}/\text{m}^3) + (2 \text{ hours})(60 \mu\text{g}/\text{m}^3) + (1.5 \text{ hours})(40 \mu\text{g}/\text{m}^3) + (3.5 \text{ hours})(0 \mu\text{g}/\text{m}^3)]}{8}$$

8 hours

OR

8-hour TWA = $[200 \mu\text{g}/\text{m}^3 + 120 \mu\text{g}/\text{m}^3 + 60 \mu\text{g}/\text{m}^3 + 0 \mu\text{g}/\text{m}^3]/8 \text{ hours}$

8-hour TWA = $[380 \mu\text{g}/\text{m}^3]/8 \text{ hours} = 47.5 \mu\text{g}/\text{m}^3$

In this example, the employee's TWA ($47.5 \mu\text{g}/\text{m}^3$) is below the PEL of $50 \mu\text{g}/\text{m}^3$.

References

1. OSHA Standard "Occupational Exposure to Respirable Crystalline Silica" - 29 C.F.R. § 1910.1053
2. OSHA "Frequently Asked Questions for General Industry" related to the Occupational Exposure to Respirable Crystalline Silica Standard - 29 C.F.R. § 1910.1053;

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