

## Exposure Monitoring Report Summary EMRS 3

### Cutting Fiber Cement with Miter Saw using a Fan to Disperse Dust

#### 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 concentrations for a Cut Station Operator and in the immediate area where fiber cement siding (FCS) trim board and lap siding were being cut with miter saws and using fans to disperse dust away from the saw operator. The purpose of the monitoring was to produce objective data<sup>1</sup> potentially useful 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

- Miter saws used included a Dewalt non-sliding compound miter saw (DW 716) and a double bevel sliding miter saw (DW 718), each equipped with a HardieBlade® 12 in. Polycrystalline Diamond (PCD) Tipped 8-Tooth and included sliding and non-sliding versions.
- Floor fan used was a Ridgid AM2560 (3.0 Amp – 1625 CFM).

##### B. Weather (environmental conditions)

- All samples were collected outside to simulate typical construction scenarios:
  - Wind varied during monitoring events from calm (0 to 2 mph) to moderately windy (15 to 21 mph).
  - RH% varied from 8 to 88 %, and Temperature ranged from 59 to 85 °F.

##### C. Other Conditions

- Cut Stations were designed, where possible, to limit exposure to RCS by placing the Cut Station Operator so that the predominant wind direction was at his back or side opposite to the saw exhaust (and therefore blowing dust away from the workers' breathing zone).

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<sup>1</sup> 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>

- Mix of FCS trim boards (>3/4 in. thick) and lap siding (5/16 in. thick) was used and based on typical construction scenarios
- Approximately 10% of the cuts involved trim boards and 90% involved siding
- Single plank cuts and stacked plank cuts were included in the monitoring based on typical jobsite scenarios
- Total cutting rates of 50 to 60 linear feet per hour of FCS (above the 95<sup>th</sup> percentile cutting rate identified for the typical high volume fiber cement installation crews)
- Exposures were monitored over a 2 to 4 hour period. On typical construction sites cutting takes place over 4 to 6 hours.
- To obtain an 8- hour TWA, the cutting activity is assumed to take place for an entire 8 hours to best determine the effectiveness of the fans under “worst-case” scenarios.

## Control Setup

- Fans were positioned in two “Setups” involving varying distances or configurations based on the saw used.
- In Setup 1 the fan is angled and directs air toward the saw from a height not level with the product surface, and with Setup 2 the fan directs air horizontally at the same level as the product surface. Two distances from the miter saw were used in Setup 2 – 3 ft. and 6 ft. See below, with 3 ft. distance shown for Setup 2.



## Results

### Personal/Worker Samples

- 12 personal samples were collected, with 5 samples collected in Setup 1 and 7 samples in Setup 2
- 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 /m<sup>3</sup>).

Worker Exposure Based on Cutting Time, Setup and Distance from Cut Station

	<b>Ridgid AM2560 (3.0 Amp – 1625 CFM)</b>	<b>Ridgid AM2560 (3.0 Amp – 1625 CFM)</b>	<b>Ridgid AM2560 (3.0 Amp – 1625 CFM)</b>
<b>Time Period</b>	<b>Setup 1</b>	<b>Setup 2 – 3 ft.</b>	<b>Setup 2 – 6 ft.</b>
Monitoring Period (102-425 mins.)	Monitoring Period Result 27.8 µg/m <sup>3</sup> (avg. RCS concentration)	Monitoring Period Result 14.7 µg/m <sup>3</sup> (avg. RCS concentration)	Monitoring Period Result 28.0 µg/m <sup>3</sup> (avg. RCS concentration)
If Monitoring Period Avg. Concentration is assumed for 8 hour TWA exposure (“worst-case”)	27.8 µg/m <sup>3</sup>	14.7 µg/m <sup>3</sup>	28.0 µg/m <sup>3</sup>
95% Confidence Interval (95% CI) for 8-hour TWA exposure	36.5 µg/m <sup>3</sup>	21.0 µg/m <sup>3</sup>	43.0 µg/m <sup>3</sup>
2 hours (if cutting duration only 2 hours and balance of workday involved no additional RCS exposure)	7.0 µg/m <sup>3</sup>	5.3 µg/m <sup>3</sup>	11.0 µg/m <sup>3</sup>
4 hours (if cutting duration only 4 hours and balance of workday involved no additional RCS exposure)	14.0 µg/m <sup>3</sup>	10.6 µg/m <sup>3</sup>	22.0 µg/m <sup>3</sup>
6 hours (if cutting duration only 6 hours and balance of workday involved no additional RCS exposure)	21.0 µg/m <sup>3</sup>	15.9 µg/m <sup>3</sup>	33.0 µg/m <sup>3</sup>

- The personal exposures associated with the Ridgid AM2560 (3.0 Amp – 1625 CFM) used in Setup 2 at 3 ft. produced an avg. 8-hour TWA of 14.7 µg/m<sup>3</sup> (95% CI = 21.0 µg/m<sup>3</sup>). All results collected on the saw operator were below the OSHA PEL.
- The personal exposures associated with the Ridgid RV2400HF Vacuum produced an avg. 8-hour TWA of <18.4 µg/m<sup>3</sup> (95% CI = <27.1 µg/m<sup>3</sup>). All results collected on the saw operator were below the OSHA PEL.
- Ridgid AM2560 (3.0 Amp – 1625 CFM) used in Setup 2 at 6 ft produced an avg. 8-hour TWA of 14.7 µg/m<sup>3</sup> (95% CI = 21.0 µg/m<sup>3</sup>). All results collected on the saw operator were below the OSHA PEL.

Area Samples

- 3 Area samples were collected approximately 7 ft. downwind from the Miter Saw Cut Stations. The samples were collected over monitoring periods ranging from 260 to 425 minutes.
- The resultant RCS concentrations ranged from <4.0 to <8.0 µg/m<sup>3</sup> (i.e., all results were below the laboratory’s Limit of Quantification) indicating no measurable concentrations of RCS were migrating from the Miter 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/m<sup>3</sup> 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/m<sup>3</sup>; and can be as high as ≤100 µg/m<sup>3</sup> 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/m<sup>3</sup> (assuming no exposure for the remainder of the shift) and a 1-hour TWA can be as high as ≤400 µg/m<sup>3</sup> (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,

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

Where “t” represents the time for each period and “c” indicates the concentration of RCS exposure during that period in micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ). 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  $200 \mu\text{g}/\text{m}^3$ ; Period 2 was performed for 2 hours with an RCS exposure of  $60 \mu\text{g}/\text{m}^3$ ; and Period 3 was performed for 1.5 hours with an RCS exposure of  $40 \mu\text{g}/\text{m}^3$ . The employee had no further RCS exposure for the remaining 3.5 hours of his shift.

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

OR

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

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

$$\text{8 hour TWA} = 47.5 \mu\text{g}/\text{m}^3$$

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

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