

Crystalline Silica Exposure

Personal Air Sampling from Exposure to Respirable Crystalline Silica

OSHA issued a final rule to combat lung cancer, silicosis, chronic obstructive pulmonary disease and kidney disease in workers by limiting their exposure to respirable crystalline silica. Estimates predict that the rule will save over 600 lives and prevent more than 900 new cases of silicosis annually.

- Establishes lower (50 µg/m³) permissible exposure limit (PEL)
- Confirms ISO/CEN criteria of a 4-µm 50% cut-point for respirable dust samplers
- Aligns OSHA with NIOSH, ACGIH, and several global occupational hygiene organizations
- Identifies samplers conforming to ISO 7708/CEN criteria can be used

Air Sampling According to the New OSHA Standard

Six existing sampling methods are identified in the new OSHA standard with the goal of optimizing the methods to obtain a quantitative limit of detection no higher than 25% of the PEL (based on air volume). A large enough sample is required to reach the detecting limit down to 12.5 micrograms/cubic meter (25% of the new PEL).

The standard recommends modifying current methods to lower the detection level by taking a larger air sample, this accounts for tasks performed for short periods of time. Applying the formula $1.7 \text{ LPM} \times 60 \times 8 \text{ hours} = 813 \text{ L} = 0.813 \text{ CM}$ you can reach the LDL on some of the methods with the traditional 10 mm nylon cyclone at 1.7 LPM in 8 hours. With a four-hour task it is necessary to double the flow rate by using a medium flow cyclone such as our 4.2 LPM cyclone. Tasks performed for only two hours will require higher flow rates to reach the LDL, by using cyclones such as the 9 LPM RASCAL.

Silica Sampling Best Practices

- Draw a large enough sample to obtain a maximum limit of detection of 12.5 micrograms per cubic meter (i.e., 25% of 50 micrograms per cubic meter)
- Use the analysis by XRD or IR as described in the six listed methods.
- Observe the cyclone flow rate specification for meeting the ACGIH size selection curve (50% at 4 microns).
- Use a constant flow control pump that will keep the flow rate at +/- 5% of set flow.
- A medium flow cyclone can meet the detecting limit in an 8 hour sample and still be comfortable to wear.

Method No.	Analysis	LDL (1.7LPM)
OSHA ID-142	XRD, Redposition	12.0 µg/m ³ (qtz)
NIOSH 7500	XRD, Redposition	6.12 µg/m ³ (8 hr)
NIOSH 7602	IR, KBr Pellet	6.12 µg/m ³ (8 hr)
NIOSH 7603	IR, Redeposition	12.24 µg/m ³ (8 hr)
MSHA P-2	XRD, Redposition	24.48 µg/m ³ (8 hr)
MSHA P-7	IR, Redeposition	24.48 µg/m ³ (8 hr)

Cyclone Model	Part Number	Flow Rate ACGIH Respirable (50% @ 4 µm)
10 mm Dorr-Oliver	800061	1.7 LPM
BGI-4L, HD style (US version)	811-9924-01	2.2 LPM
Medium flow rate GK 2.69 for 37 mm Cassettes	811-9926-01	4.2 LPM
High flow rate RASCAL Cyclone with Plastic Filter Holder	811-9925-01	8.5 to 9.5 LPM

37 mm cassette version of the GK 2.69 cyclone is recommended over the 25 mm due to the higher backpressure caused by the smaller cassette.

