



OSHA 29 CFR §1926.1153
Respirable Silica Dust Exposure
Objective Test Data

Hilti DCH 230-300 with VC 20-U/40-U/40-UE vacuum

Hilti has performed testing of the above system to determine the operator's respirable silica dust exposure in accordance with EN 50632-1 and EN 50632-2-22. Testing was performed under the following conditions:

- Room size: 7.8m x 7.8m x 3.3m (200 m³). Closed – no air exchange.
- Cutting disc: EQD SPX.
- Test duration: 1 hour.
- Cutting depth: 40 mm.
- Cutting length: 45 feet.
- Cutting orientation: horizontal down, approx. 3 ft above floor level.
- Force applied: average 70-90% of tool rated amperage.
- Base material: concrete.
- Sampler: 10 l/min GSP pump, FSP sampler. ISO 7708-compliant. 5 µm filter.
- Air sample volume collected during test: 600 liters.

Results:

Time-Weighted Average Respirable Silica Dust Exposure ^{1,2}	327 µg/m ³
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The 8-hour TWA is 41 µg/m³ if working one hour @ 327 µg/m³ (1-hour TWA), and no further exposure occurs throughout the shift.

¹ The silica content of base materials varies. As a result, the silica content in respirable dust samples also varies. The above-published exposure value is based on a 20% silica content applied to the total respirable dust measurement. Measured average silica content during testing was 15.5%.

² Exposure value represents the time-weighted average (TWA) over the 1-hour test period. Due to the test being conducted in a closed, non-ventilated room, this TWA exposure value would increase if the test duration was extended under the same conditions.



29 CFR §1926.1153(d)(2)(ii)

Performance Option

How to utilize Hilti “Objective Data”

Hilti has conducted testing to establish the respirable silica dust exposure (“exposure level”), associated with the use of various Hilti tool systems. These tests were performed in accordance with EN 50632, except the specific work configuration may vary to provide more versatile data and better address U.S. practices. The purpose of the testing was to generate “Objective Data” to be used as part of the exposure assessment requirements of 29 CFR §1926.1153(d)(2)(ii).

Per the EN standard, testing was performed for 1 hour in a 200m³ closed, non-ventilated room. Under these conditions, exposure levels increase over time. The exposure values published in Hilti’s Objective Data represent the average over the 1-hour test period (1-hour TWA)¹. Meaning the TWA started at zero, rose to the published 1-hour value, and would continue to rise if the test were continued.

Several underlying concepts important to applying the Objective Data to any case-specific assessment:

1. More/less work performed in a given time period will increase/decrease the exposure level.
2. Larger/smaller room size will decrease/increase the exposure level.
3. Air exchange decreases exposure levels. Specifically, a 100% air-exchange every hour (either by the work moving to a discrete area, or via sufficient air movement), means Hilti’s published 1-hour TWA exposure level is expected to conservatively represent a steady-state TWA. The conceptual basis is two-fold: air exchange would inherently reduce the published “closed room” exposure value. And sufficient air exchange to “reset” the environment every hour would keep the exposure values at that level. For reference, a typical 20”, 2500 CFM box fan would introduce 100% new air volume in Hilti’s test chamber (7,200 ft³), every 3 minutes².
4. The OSHA 50 µg/m³ Permissible Exposure Level (PEL), is based on an 8-hour TWA. This means the exposure level as an 8-hour TWA is ≤50 µg/m³; a 4-hour TWA is ≤100 µg/m³ (assuming no exposure for the remainder of the shift); a 2-hour TWA is ≤200 µg/m³ (assuming no exposure for the remainder of the shift) etc. (time [hours] x exposure level [µg/m³] ≤ 400).

Hilti’s published Objective Data states the amount of work performed during the 1-hour test (“1-hour work”). Therefore, the respirable silica dust exposure level in any case-specific situation is expected to be below the 8-hour TWA PEL in the following conditions³:

- An employee performing ≤ “1-hour work” during a shift.
- An employee performing ≤ “1-hour work” in an hour, then moving to another discrete area and performing ≤ “1-hour work” in an hour, etc., throughout an entire shift.
- An employee performing ≤ “1-hour work” each hour, in an environment with sufficient air-exchange to prevent accumulation of airborne dust.

¹ Hilti’s published Objective Data incorporates a silica content of 20% of the total respirable dust measurement. Site-specific silica content varies. OSHA Docket No. OSHA-2010-0034, reviewed 588 respirable dust samples from construction tasks, finding the silica content varied from <1%-50%, with an average of 9.1%.

² Note introduction/exhaust of 100% air volume does not necessarily correlate to a 100% air exchange.

³ As long as: (1) Hilti’s published Objective Data exposure level is ≤50 µg/m³; (2) work is performed in a room with volume ≥ 200m³, and/or having adequate ventilation; and (3) site-specific respirable silica content is ≤20% of total respirable dust.



OSHA 29 CFR §1926.1153
Respirable Silica Dust Exposure

Objective Test Data – Overhead drilling Hilti TE 4-A/6-A with on-board dust removal system (DRS)

Hilti has performed testing of the above system to determine the operator's respirable silica dust exposure in accordance with EN 50632-1 and EN 50632-2-6¹. Testing was performed under the following conditions:

- Room size: 7.8m x 7.8m x 3.3m. Closed – no air exchange.
- Drilled hole dimensions: $\varnothing 5/8"$ x 2".
- Test duration: 1 hour.
- Total holes drilled: 75.
- Drilling orientation: overhead.
- Base material: concrete.
- Sampler: 10 l/min GSP pump, FSP sampler. ISO 7708-compliant. 5 μ m filter.
- Air sample volume collected during test: 600 liters.
- Dust collection receptacle on tool emptied every 8 holes drilled.

Results:

Time-Weighted Average Respirable Silica Dust Exposure ^{2,3}	45 μ g/m ³
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¹ Exception: EN 50632-2-6 specifies drilling one hundred twenty $\varnothing 16$ mm x 50mm holes at a 15° downward-from-horizontal position; and the monitor be equipped with an 8-micron filter.

² The silica content of base materials varies. As a result, the silica content in respirable dust samples also varies. The above-published exposure value is based on a 20% silica content applied to the total respirable dust measurement. Measured average silica content during testing was 13.8%.

³ Exposure value represents the time-weighted average (TWA) over the 1-hour test period. Due to the test being conducted in a closed, non-ventilated room, this TWA exposure value would increase if the test duration was extended under the same conditions.



29 CFR §1926.1153(d)(2)(ii)
Performance Option
How to utilize Hilti “Objective Data”

Hilti has conducted testing to establish the respirable silica dust exposure (“exposure level”), associated with the use of various Hilti tool systems. These tests were performed in accordance with EN 50632, except the specific work configuration may vary to provide more versatile data and better address U.S. practices. The purpose of the testing was to generate “Objective Data” to be used as part of the exposure assessment requirements of 29 CFR §1926.1153(d)(2)(ii).

Per the EN standard, testing was performed for 1 hour in a 200m³ closed, non-ventilated room. Under these conditions, exposure levels increase over time. The exposure values published in Hilti’s Objective Data represent the average over the 1-hour test period (TWA)¹. Meaning the TWA started at zero, rose to the published 1-hour value, and would continue to rise if the test were continued.

Several underlying concepts important to applying the Objective Data to any case-specific assessment:

1. More/less work performed in a given time period will increase/decrease the exposure level.
2. Larger/smaller room size will decrease/increase the exposure level.
3. Air exchange decreases exposure levels. Specifically, a 100% air-exchange every hour (either by the work moving to a discrete area, or via sufficient air movement), means Hilti’s published 1-hour TWA exposure level is expected to conservatively represent a steady-state TWA. The conceptual basis is two-fold: air exchange would inherently reduce the published “closed room” exposure value. And sufficient air exchange to “reset” the environment every hour would keep the exposure values at that level. For reference, a typical 20”, 2500 CFM box fan would introduce 100% new air volume in Hilti’s test chamber (7,200 ft³), every 3 minutes².
4. The OSHA 50 µg/m³ Permissible Exposure Level (PEL), is based on an 8-hour TWA. This means the exposure level as an 8-hour TWA is ≤50 µg/m³; a 4-hour TWA is ≤100 µg/m³ (assuming no exposure for the remainder of the shift); a 2-hour TWA is ≤200 µg/m³ (assuming no exposure for the remainder of the shift) etc. (time [hours] x exposure level [µg/m³] ≤ 400).

Hilti’s published Objective Data states the amount of work performed during the 1-hour test (“1-hour work”). Therefore, the respirable silica dust exposure level in any case-specific situation is expected to be below the 8-hour TWA PEL in the following conditions³:

- An employee performing ≤ “1-hour work” during a shift. This includes job rotation, with each employee performing ≤ “1-hour work” during their shift.
- An employee performing ≤ “1-hour work” in an hour, then moving to another discrete area and performing ≤ “1-hour work” in an hour, etc., throughout an entire shift.
- An employee performing ≤ “1-hour work” each hour, in an environment with sufficient air-exchange to prevent accumulation of airborne dust.

¹ Hilti’s published Objective Data incorporates a silica content of 20% of the total respirable dust measurement. Site-specific silica content varies. OSHA Docket No. OSHA-2010-0034, reviewed 588 respirable dust samples from construction tasks, finding the silica content varied from <1%-50%, with an average of 9.1%.

² Note introduction/exhaust of 100% air volume does not necessarily correlate to a 100% air exchange.

³ As long as: (1) Hilti’s published Objective Data exposure level is ≤50 µg/m³; (2) work is performed in a room with volume ≥ 200m³, and/or having adequate ventilation; and (3) site-specific respirable silica content is ≤20% of total respirable dust.



OSHA 29 CFR §1926.1153
Respirable Silica Dust Exposure
Objective Test Data – Grinding
Hilti DG 150 with VC20/40/40U vacuum

Hilti has performed testing of the above system to determine the operator's respirable silica dust exposure in accordance with EN 50632-1 and EN 50632-2-3. Testing was performed under the following conditions:

- Room size: 7.8m x 7.8m x 3.3m (200 m³). Closed – no air exchange.
- Grinding disc: DG-CW 150/6" CR-SP
- Test duration: 1 hour.
- Weight of collected dust: 1590 g.
- Grinding orientation: 15° from vertical.
- Grinding height: 2'-6' above floor-level.
- Force applied: average 70-90% of tool rated amperage.
- Base material: concrete slab.
- Sampler: 10 l/min GSP pump, FSP sampler. ISO 7708-compliant. 5 µm filter.
- Air sample volume collected during test: 600 liters.

Results:

Time-Weighted Average Respirable Silica Dust Exposure ^{1,2}	43 µg/m ³
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¹ The silica content of base materials varies. As a result, the silica content in respirable dust samples also varies. The above-published exposure value is based on a 20% silica content applied to the total respirable dust measurement. Measured average silica content during testing was ???%.

² Exposure value represents the time-weighted average (TWA) over the 1-hour test period. Due to the test being conducted in a closed, non-ventilated room, this TWA exposure value would increase if the test duration was extended under the same conditions.