PEL Reference Formulas & Examples

Construction/Maritime PEL for Crystalline Silica (Quartz) -- General Industry PEL for Crystalline Silica (Quartz) -- OSHA-adopted conversion factor:

1 mppcf = 0.1 mg/m3 respirable dust   or
1 mg/m3 = 10 mppcf respirable dust

Example 1: A sample is obtained for a jackhammer operator, using the gravimetric sampling method specified in OSHA ID-142. The sample is run for 240 minutes at a flow rate of 1.7 liters per minute (L/min), yielding a total sample volume of 0.408 m3. The respirable dust collected on the filter is determined to weigh 0.857 mg, resulting in a respirable dust concentration of 2.1 mg/m3. OSHA's Salt Lake Technical Center (SLTC) laboratory reports that the sample contains 55 percent quartz. SLTC also reports a Sampling and Analytical Error (SAE) of 0.20 for the sample.

Step1. Determine the jackhammer operator's 8-hour Time Weighted Average (TWA) respirable dust exposure (assuming zero exposure for the unsampled portion of the 8-hour shift):

Step 2. Calculate the general industry PEL, assuming the conditions for the jackhammer operator sample containing 55 percent respirable quartz:

Step 3. Calculate the Severity Ratio

Step 4. Calculate confidence limits by applying the sampling and analytical error (SAE):

   Lower Confidence Limits (LCL) = 5.4 - 0.20 = 5.2

Step 5. Based on a severity of 5.4, the sample exceeds the 95% confidence limit for overexposure.

Step 6. Apply the OSHA-adopted conversion factor to the jackhammer operator's exposure result from Step 1 and Reference Formula (B) above:

Step 7. Calculate the applicable construction PEL, for jackhammer operator sample containing 55 percent respirable quartz:

Step 8. Conclusion. The 8-hour TWA exposure of the jackhammer operator exceeds the construction industry PEL for crystalline silica (quartz).

Example 2: Two samples are obtained for a construction foreman overseeing a concrete drill press operation. Both samples are collected at a flow rate of 1.7 L/min. The duration of Sample A is 238 minutes, yielding a total sample volume of 0.40 m3. The respirable dust collected on the filter is determined to weigh 0.855 mg, resulting in a respirable dust concentration of 2.1 mg/m3. The SLTC laboratory reports that Sample A contains 30 percent quartz. The duration of Sample B is 192 minutes, yielding a total sample volume of 0.326 m3. The respirable dust

weight is 0.619 mg, resulting in a concentration of 1.9 mg/m3. The total weight of respirable dust collected on both samples is 1.474 mg. The SLTC laboratory reports that Sample B contains 25 percent quartz. SLTC reports an SAE of 0.16 for both samples.

Step 1. Determine the foreman's 8-hour TWA respirable dust exposure:

Step 2. Determine average quartz content since SLTC provided two different percentages of quartz:

Step 3. Calculate the general industry PEL, assuming the conditions for the construction foreman sample containing 28 percent respirable quartz:

Step 4. Calculate the Severity Ratio

Step 5. Calculate confidence limits by applying the sampling and analytical error (SAE):

Lower Confidence Limits LCL = 5.4 - 0.16 = 5.24

Step 6. Based on a severity of 5.4, the sample exceeds the 95% confidence limit for overexposure.

Step 7. Apply the OSHA-adopted conversion factor to the construction foreman's exposure result from Step 1 and Reference Formula (B) above:

Step 8. Calculate the applicable construction PEL, using Reference Formula (A) above, for the foreman's samples containing an average of 28 percent respirable quartz:

Step 7. Conclusion. The 8-hour TWA exposure of the foreman exceeds the construction industry PEL for crystalline silica (quartz).