PCI™ Precast/Prestressed Concrete Institute

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U.S. Department of Labor
Room N-2625
OSHA
200 Constitution Avenue NW
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Comments on OSHA Proposed Revisions to Silica Regulations
from the Precast Concrete Structures Industry

Some fabrication processes within the precast concrete structures industry potentially expose workers to crystalline silica, and the industry shares OSHA's commitment to a safe and healthful workplace. We commend OSHA for its initiative in raising awareness within US industry of this potential hazard and establishing a Permissible Exposure Limit (PEL) for crystalline silica. We also note that at least partly because of efforts by this and other industries to measure and control exposure, deaths attributed to silicosis in the United States have declined by an order of magnitude since the early 1970s. We anticipate that this trend will continue.

POSITION

PCI strongly disagrees with OSHA's proposal to make fundamental changes to an apparently successful effort by significantly reducing the PEL for crystalline silica, and we agree with and endorse the position of the American Chemistry Council Crystalline Silica Panel in this regard. Our reasons are as follows.

1. **OSHA has failed to properly demonstrate that the present hazard posed by workplace crystalline silica exposure is "significant."**

Flawed analysis.

The US Supreme Court defined the conditions that must be met in order for OSHA to reduce an exposure limit (PEL) in *Industrial Union Department, AFL-CIO v. American Petroleum Institute* [10 ELR 20489 Nos. 78-911, -1036 (U.S. July 2, 1980)]. In this case, OSHA's action to reduce the permissible airborne concentration of benzene from 10 parts per million to one ppm (an action very similar to the one currently in question) was overturned because (emphasis added):

> *[T]he record contains no **direct evidence** showing that a concentration of one ppm poses any risk, nor that lowering the limit will increase worker safety. OSHA based its decision to lower the standard on its policy of limiting exposure to carcinogens for which there is no known safe exposure level to the lowest level that can feasibly be attained by industry. The Court concludes that **this reasoning is based on a misinterpretation of the Occupational Safety and Health (OSH) Act.** Section 3(8) of the Act defines health and safety standards as those reasonably necessary to provide safe or healthful employment; §6(b)(5) of the Act provides that standards must assure that to the extent feasible no employee will suffer material impairment of health. In conjunction, **these provisions require the Secretary, before making a standard more strict, to determine that there is a***

> ***significant health risk at the higher standard and thus that lowering the standard will reduce that risk****... The Court emphasizes that while the* ***agency's findings must be based on substantial evidence****, § 6(b)(5) of the Act allows it to regulate on the basis of the* ***best available evidence****. Therefore, the agency is free to use conservative assumptions, risking on the side of overprotection rather than underprotection, so long as they are supported by a body of reputable scientific thought.*

OSHA's justification for reducing the crystalline silica PEL is based on an extrapolation using several relative risk models of mortality data sets for selected worker cohorts. This is a highly indirect method; the evaluation of risk was based upon a modeled extrapolation of (in some cases unrelated) data, and not on direct evidence.

OSHA's use of modeling to extrapolate selected data down to lower levels of exposure can only be founded on the unstated assumption that there is no known safe exposure level for crystalline silica. Furthermore, OSHA reinforces its argument to lower the crystalline silica PEL through an exhaustive analysis purporting to show that exposure levels can be reliably measured at the proposed lower level. Besides stating, but then ignoring, the significant uncertainties in this analysis, making such an argument clearly indicates that the regulatory philosophy behind the proposed PEL reduction is to reduce exposure to the lowest level that can feasibly be attained by industry. These two branches of the rationale demonstrated in OSHA's justification (i.e., that there is no known safe exposure level and that the PEL should be reduced to the lowest level that can feasibly be attained by industry) are precisely what the Supreme Court found to be "a misinterpretation of the Occupational Safety and Health (OSH) Act" (*op cit*).

In short, it is OSHA's mandate to eliminate significant workplace hazards; it is not OSHA's job to reduce workplace risk to near-zero levels. Where there is no significant hazard, there is no need for OSHA action.

OSHA's analysis is riddled with compromises and uncertainties, beginning with the foundation data. OSHA correctly recognizes the uncertainties in the epidemiological studies upon which its conclusions are based, and that these uncertainties are not only statistical, but stem from the tangential applicability of the study subjects themselves to the typical nature of exposure in the US workplace. For example, OSHA acknowledges "that differences exist in the relative toxicity of crystalline silica particles present in different work settings due to factors such as the presence of mineral or metal impurities on quartz particle surfaces, whether the particles have been freshly fractured or are aged, and size distribution of particles." [Silica PEA page VII-10]

However, it dismisses concerns over such non-statistical uncertainties based on the fact that it utilized "a range of estimates derived from the full set of available studies, rather than relying on any single study" and contends that this approach "better reflects the uncertainties in the estimates and more fairly captures the range of risks likely to exist across a wide range of industries and exposure situations." [Silica PEA page VII-9]

In summary, OSHA's evaluation of risk due to crystalline silica exposure was based upon a modeled extrapolation of data that was, at least in part, not directly applicable to the US workforce in the first place. OSHA applies exhaustive statistical analysis to give the impression of greater certainty than in fact exists with such a methodology. Absent a more reliable method, such an indirect approach might arguably be acceptable under the "conservative assumptions" provision in the above-cited Supreme Court decision.

Proven and superior approach for analyzing worker risk from exposure to crystalline silica.

OSHA has at its disposal not only a superior method, but the best possible analytical tool: the actual measured results in the entire affected population over 40 years of regulatory controls at the present PEL. These results should clearly be given far more weight than those of the convoluted approach chosen by OSHA. What are these results?

The Centers for Disease Control and Prevention (CDC) report a dramatic decline in silicosis-related mortality in the US over the past four decades (Figs. 1 and 2). Over the 34-year period from 1968 through 2002, silicosis was recorded as an underlying or contributing cause of death on a total 16,305 death certificates (CDC, 2005). The annual number of silicosis deaths in 1968 was 1,157 (8.91 per million persons above 15 years of age). By 2002, this

had decreased 93% to only 148 (0.66 per million), a remarkable decline, equivalent to an average decrease of roughly 13% per year. Since 2002 the rate of decline has leveled off. The most recent data from NIOSH (for 2010) shows deaths from silicosis below 100, which for the 8-year period from 2002 through 2010 would be equivalent to an average decrease of roughly 1% per year. However, while the decline in silicosis mortality has certainly slowed, there is no indication that it has stopped.

We believe two main factors are responsible for the major drop in silicosis deaths. First, OSHA actions in the early 1970s transformed the industrial climate by (1) making industries aware of the risk of crystalline silica exposure, (2) setting clear and practically measurable limits, and (3) providing support, and, as needed, enforcement action. Second, industry responded responsibly with significant improvements in worker protection from exposure to silica. This performance is exactly what we should expect from a reasonably effective regulatory program. But could it be made more effective?

2. OSHA's proposed approach to reducing exposure to crystalline silica is conceptually flawed.

The basis of OSHA's proposed approach is essentially to require the employer to create a work environment whose concentrations of airborne crystalline silica are at or below the lower threshold of practical measurement, such that workers in the area do not require protective equipment. The Preamble states:

> *OSHA must prove a reasonable possibility that the typical firm will be able to develop and install engineering and work practice controls that can meet the PEL in most of its operations … The effect of such proof is to establish a presumption that industry can meet the PEL without relying on respirators … Insufficient proof of technological feasibility for a few isolated operations within an industry, or even OSHA's concession that respirators will be necessary in a few such operations, will not undermine their general presumption in favor of feasibility. Rather, in such operations, firms will remain responsible for installing engineering and work practice controls to the extent feasible, and for using them to reduce exposure as far as these controls can do so.*

OSHA considers respiratory protective equipment as a last resort after all possible engineering controls or work practices have failed to achieve the PEL. There is simply no precedent or rational basis for such a regulatory approach, particularly with the availability of protective equipment of proven effectiveness.

Employers and workers have found personal protective equipment (PPE) to be a cost-effective method of limiting silica exposure. OSHA discourages using PPE because workers might not wear PPE or that it might not be properly maintained. If an employer is incapable of maintaining PPE and properly training employees in its use, how can that same employer be expected to install, manage, and maintain the much more complex engineering controls that OSHA proposes? A conservative protection factor can be determined for any PPE, assuming proper maintenance, worker training, etc., which could easily be applied to the actual measured air environment to demonstrate compliance with the PEL.

OSHA's own analysis determined that engineering and work practices would not be sufficient to limit silica exposures to a maximum of 25 $\mu g/m^3$ in most operations most of the time. In the Preamble, page 25, OSHA states that its decision to propose an Action Level for exposure monitoring of one-half of the PEL is based on its successful experience with other standards, with no further basis. It is doubtful that in these other examples this approach involved Action Levels set below the lower limit of reliable measurement.

OSHA states that one of the purposes of requiring expensive monitoring is to motivate employers to implement controls. First, this approach is insulting to a responsible industry that is as interested in the health of its workers as is any governmental agency. Second, it is risky to invest in expensive equipment and controls with no guarantee that they will be effective. Third, if additional controls have been demonstrated to be infeasible or ineffective, continuing quarterly or semi-annual monitoring would waste resources that could be better applied to other safety and health concerns (e.g. annual medical surveillance of exposed workers). Finally, this is again a requirement that punishes the compliant with no effect on the noncompliant.

3. OSHA's proposed approach will not significantly reduce worker risk from exposure to crystalline silica.

Figure 3 shows the number of silica-related construction inspections in the 5-month period from September 1996 to January 1997. The regional variability is remarkable. Figure 4 is a tally of Special Emphasis Program (SEP) inspections from August 1996 to August 1997. It shows only 663 inspections with a total of 1,784 violations. It would appear that inspection and enforcement of the current regulation has been sporadic.

Table III-1 in the Notice of Proposed Rulemaking (NPRM) examined enforcement data from 1997 through 2002, the first five years of the SEP for silica. It illustrates high rates of noncompliance with OSHA's PEL for respirable crystalline silica, with 33% of general industry exceeding the current PEL of 100 µg/m^3 and 13% exceeding it by a factor of 3 or more. For the construction industry the figures were worse, with 42% exceeding the current PEL and 24% exceeding it by a factor of 3 or more.

Table III-2 in the NPRM shows that from January 2003 to December 2009 (the period of continued implementation of the SEP and the first two years of National Emphasis Program), 30% of general industry exceeded the current PEL, and 19% exceeded it by a factor of 3 or more. The construction industry shows improved compliance, with 25% exceeding the PEL and 14% exceeding it by a factor of 3 or more.

According to the agency, in 2010 OSHA and its state partners inspected 1% of establishments under OSHA jurisdiction (approximately 98,000 inspections of 7.5 million total establishments). This is not an unreasonable percentage, but the persistent levels of noncompliance indicate that there is still opportunity for reduction of silica-related risk.

Implementation of more stringent PELs and Action Levels will not affect already-noncompliant workplaces, where workers will continue to be overexposed to silica. They will only affect compliant firms. If 30-50% of industry cannot comply with the current PEL, how is it feasible to comply with reductions of 50-75% in the new PELs and Action Levels? The question that must be answered is how many lives could be saved and how many cases of silicosis could be prevented by more widespread compliance with the current PEL.

Logic dictates that in a market-driven economy, to reduce the frequency of noncompliance you need to reduce the cost of compliance (or, alternatively, increase the cost of noncompliance). OSHA's approach, with PELs set to the lower limits of reliable measurement, would increase both the frequency of noncompliance and the cost of compliance.

4. Industry efforts to comply with OSHA's proposed Rule are likely to be costly and unlikely to be successful.

Measuring low concentrations of airborne silica

Current methods for measuring silica concentrations have a reliable minimum detection limit of 100 µg/m^3. On page 49 of the Preamble, OSHA made a preliminary determination that the 50 µg/m^3 is the lowest concentration that is technologically feasible to measure. At concentrations below about 50 µg/m^3, measurements are so imprecise as to call into question their validity.

OSHA participates in a program to compare laboratory test results of defined and controlled silica samples; variations among laboratories can easily be up to 40%. The most recent published round of proficiency analytic testing, or "PAT," indicated that the typical silica sample analyzed by an experienced laboratory using approved analysis methods on average results in a coefficient of variation (the standard deviation divided by the mean) of 14.8% for a spiked sample containing 113 µg/m^3 and 16.7% for a sample spiked with 63 µg/m^3 of silica. Even for the sample containing 113 µg/m^3 of silica, the laboratory analysis would be within ± 29% 95% of the time. At 63 µg/m^3 the

results reported by the PAT laboratories had a coefficient of variation of 16.7%, meaning that the results would be within ± 32.7% 95% of the time. Grunder, F., "PAT Program Report: Background and Current Status," 64 *AIHA Journal* 708 (Sept./Oct. 2003). These results fail to meet the NIOSH precision limit of ± 25%.

The present PEL formula is based on particle-counting technology, which OSHA considers obsolete. However, all existing PEL test data are based on this technology. It is not clear how the proposed test technology correlates with existing data or whether monitoring will need to be repeated using the new test.

Practicality of compliance measures

On a construction site, trades personnel, laborers, and other workers often work in close proximity to one another. They work for different subcontractors and in many cases lack specialized training. The proposed establishment of regulated areas for working with silica-containing materials, particularly when there are multiple work sites that may be periodically relocated, would impose an undue burden on employers.

It would be difficult if not impossible to create restricted work areas outdoors, as wind could cause large areas of a construction site to become off-limits (work has to cease or everyone wear a respirator). Even a slight breeze may result in off-site airborne silica dust contaminating the site.

Cost of proposed compliance measures

Sandblasters in the Precast Concrete Structures Industry participate in a respiratory protection program. They are required to use Type CE respirators, are properly trained in both respiratory protection and hazard communication, and are required to comply with current OSHA requirements.

Initial costs associated with compliance would be significant. Each affected plant would need to establish a demarcated controlled-access area around sandblasting activities. The required extent of such an area, and thus the practicality of this approach, has yet to be determined. A plant with limited yard space doing outdoor abrasive blasting would need to enclose the work area with a building or other enclosure at an estimated cost of $300,000 to $1,000,000. Other initial costs of about $20,000 would be associated with dust collection from other operations and testing. Ongoing costs would also be significant, and are reviewed in the Supporting Discussion.

Noncompliance inevitable; enforcement arbitrary

The lack of precision in measurement at these concentrations would make reliable monitoring nearly impossible, compliance unverifiable, and enforcement therefore arbitrary. OSHA stated it did not include an Action Level for the 50 µg/m^3 in the SBREFA Packet for General Industry (October 13, 2003) because the reliability of the sampling and analytical method for assessing worker exposure to crystalline silica declines markedly as exposures fall significantly below 50 µg/m^3.

If OSHA establishes an Action Level as low as 25 µg/m^3 for the 50 µg/m^3 PEL alternative, employers might not be able to reliably identify workers who needed to be offered health screening or training. Therefore, the draft standards did not specify a separate Action Level for the alternative PEL of 50 µg/m^3. For this same reason, OSHA was not considering alternative PELs below 50 µg/m^3. Why propose an Action Level of 25 µg/m^3 when the SBREFA packet did not provide for a discussion of this Action Level? Also, the additional monitoring between 50 and 25 µg/m^3 was not evaluated during the SBREFA review.

In summary, our industry can and does comply with the existing PEL of 100 µg/m^3. However, efforts to achieve consistent compliance with the proposed PEL of 50 µg/m^3 are likely to be costly and unlikely to be successful.

RECOMMENDATIONS

- The crystalline silica PEL should remain at 100 µg/m^3 with monitoring every 6 months.

- An employer should be allowed to use, at its own discretion, any or all mitigation methods to achieve PEL compliance, including PPE (with appropriate verification of equipment condition, worker training, etc.), engineering controls, and work practice measures.

- OSHA should clarify that the "performance option" allows an employer to reduce or suspend monitoring when it has been determined that it is infeasible to reduce exposure below the PEL (e.g. for abrasive blasting, tuckpointing, and grinding).

- OSHA should enhance its enforcement efforts, concentrating on industries that have posed the greatest risks to workers, and increase the cost of noncompliance.

The Precast Concrete Structures Industry is committed to the health of its workers, and is willing to work with OSHA to achieve real reductions in worker exposure. We see the proposed Rule as reflecting an impractical regulatory philosophy, flawed science, and a generally contemptuous attitude toward industry.

Very truly yours,

James G. Toscas
President

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JGT: cb

FIGURES

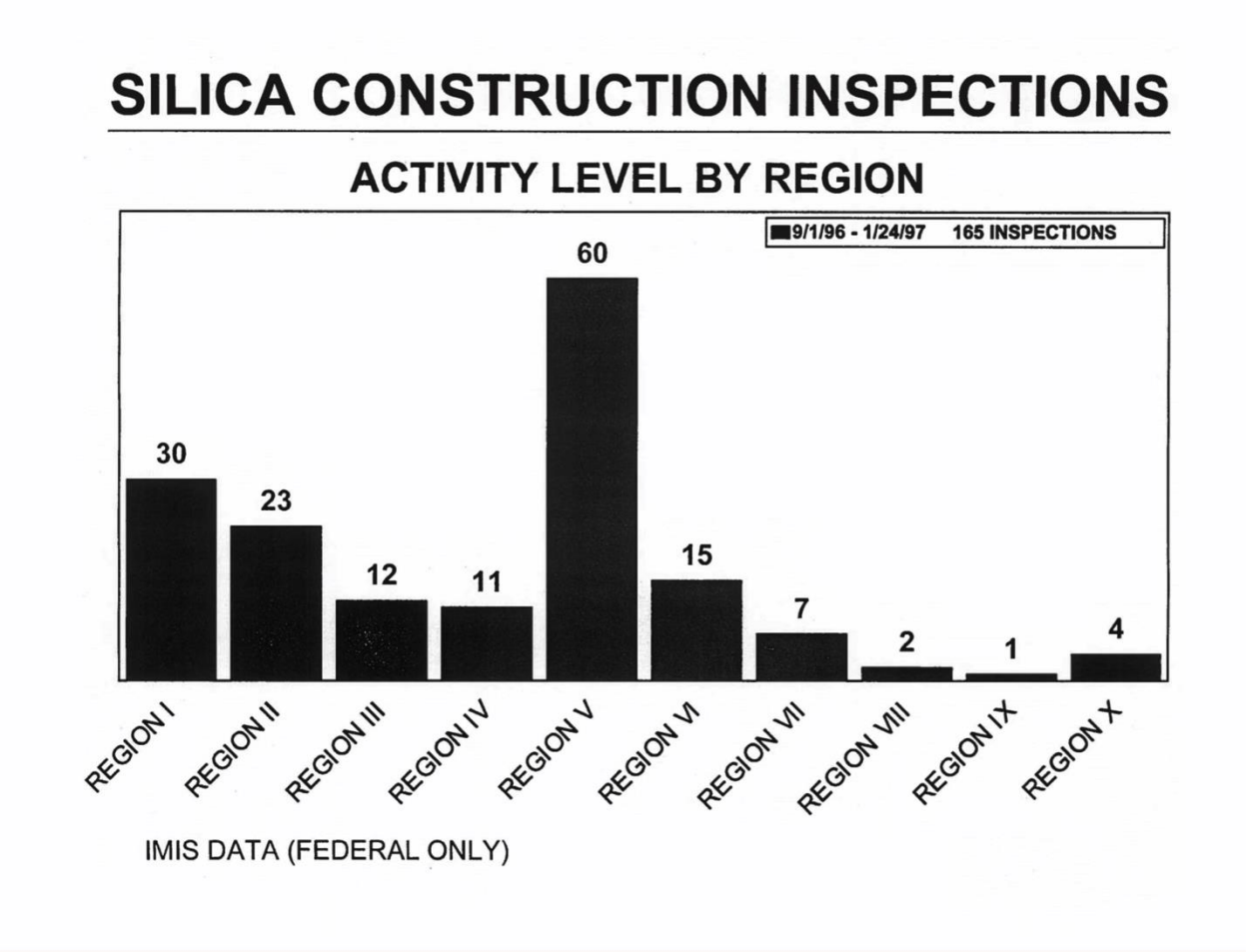

FIGURE 3

FIGURE 4

CRYSTALLINE SILICA SEP INSPECTION DATA
COVERING THE PERIOD OF
AUGUST 1, 1996 - AUGUST 24, 1997

FEDERAL DATA ONLY	*TOTALS*
NUMBER OF INSPECTIONS	*663*
INSPECTIONS BY TYPE	
ACCIDENTS	*0*
COMPLAINTS	*140*
REFERRALS	*118*
MONITORING	*10*
FOLLOW-UP	*14*
UNPROGRAMMED RELATED	*36*
PROGRAMMED PLANNED	*323*
PROGRAMMED RELATED	*22*
INSPECTIONS BY INDUSTRY	
CONSTRUCTION	*231*
MARITIME	*13*
MANUFACTURING	*372*
OTHER	*47*
TOTAL VIOLATIONS	*1,784*
VIOLATIONS BY TYPE	
WILLFUL	*10*
REPEAT	*41*
SERIOUS	*1,150*
UNCLASSIFIED	*1*
OTHER THAN SERIOUS	*570*
FAILURE TO ABATE	*12*
*TOTAL CURRENT PENALTY**	*$1,626,735*
CURRENT PENALTIES BY VIOLATION TYPES	
WILLFUL	*$241,000*
REPEAT	*$180,750*
SERIOUS	*$1,054,885*
UNCLASSIFIED	*$80,000*
OTHER THAN SERIOUS	*$15,100*
FAILURE TO ABATE	*$55,000*

** Current penalties are for cases that are open and closed.*

SUPPORTING DISCUSSION

Ongoing costs of compliance for the Precast Concrete Structures Industry

Alternatives to silica sand.

The Precast Concrete Structures Industry has investigated blasting abrasives other than silica sand. However, the aesthetic requirements of architectural cladding preclude the use of abrasives such as coal slag or steel grit that may cause particle embedment and discoloration. We also understand that OSHA is considering publishing in April a proposed rule on Beryllium (Be), which may be found in high concentrations in coal and copper slags. Staurolite, Olivine, baking soda, nut shells, glass beads and dry ice are not aggressive enough to provide the desired concrete finishes. Aluminum oxide and stainless steel grit are cost prohibitive. That basically leaves three abrasives for attaining the desired finish: crushed glass, garnet, and nepheline syenite.

A precast concrete plant typically uses between 650 and 2,080 tons of sand per year at a cost between $10 and $45 per ton, with $25 as an average. Assuming an average of 1,000 tons of sand, the annual cost is $25,000.

- Crushed window glass ranges from $100 to $175/ton
- Crushed bottle glass may be as much as $250/ton
- Garnet ranges from $180 to $325/ton
- Nepheline Syenite ranges from $160 to $180/ton

Based on the same 1,000 tons of sand, the annual increases in plant costs for abrasives are:

- Glass (window): $75,000 annually
- Glass (bottle): $225,000 annually
- Garnet: $155,000 annually
- Nepheline syenite: $135,000 annually

Water to limit dusting.

The use of wet blasting with silica sand is not feasible because the finisher needs to continuously observe the concrete surface to achieve consistent results, and the slurry mud from wet blasting obscures the surface; precast concrete plants located in cold climates could not sandblast in winter as water freezes (plants need to blast to meet their contractual schedule); and water is not always available on construction sites while precast concrete is being erected.

Table 1 (Construction) allows the use of water delivery systems without the use of respiratory protection for a number of operations; we strongly believe that commercially available shrouds and dust collection system with or without respirators can be used if the silica exposure will be below the PEL.

If water must be available on a construction site, the General Contractor or Construction Manager should be responsible to supply it. Even where water is available, its use is significantly influenced by wind and temperature. Freezing can increase hazards of ice and slipping. For erectors working at heights, the hazard is even greater. Calcium chloride (salt) is not permitted on precast concrete to prevent icing because of possible corrosion of

reinforcement and prestressing strand. Even in warmer weather, slurry could present a slip hazard and must be removed before it can dry, slowing erection and increasing costs. Also, some building materials must be kept dry to prevent potential mold problems.

For rotary hammers or drills, Table 1 requires that they must be equipped with a hood or cowl with a HEPA vacuum system. This may turn a one-person operation into a two-person operation, as someone may need to hold and move the equipment as the work progresses.

Medical surveillance.

The intermittent nature of silica-related operations poses an obstacle to monitoring employee exposures during construction activities. Medical surveillance is not practical where employee turnover is high (transient workforce). Typical precast concrete erection projects last from one week to several months. The majority of erection crews are hired from local union halls, and many unions do not allow pre-hire testing. The Americans with Disabilities Act may prevent pre-employment medical testing, making medical qualification difficult. If permitted, fit testing and associated medical clearance for one worker cost between $75 and $400, depending on location.

The use of historical data is necessary in construction because erection may be completed before results are available. We assume a database of exposure monitoring results from member companies could provide such data.

A precast concrete plant would need to conduct up to 50 medical assessments per year at a cost of $300 each, or $15,000 per year. An additional employee may also be needed to manage the new program at a cost of $50,000-$60,000 per year.

Costs associated with regular monitoring are high. The cost of a single one-day monitoring visit by an industrial hygienist, assuming 8 hours on site, 3 hours for preparation, 5 hours for report writing, and 4 hours for travel, would be at least $1,000 plus $100-$150 for the laboratory tests.

A powered air-purifying respirator (PAPR) is expensive, as is a wet/dry HEPA vacuum / collection system (at least $1,500). HEPA filters, particularly in a dusty environment, tend not to work well and require frequent maintenance.

Job rotation.

We are concerned that the proposed prohibition on job rotation to comply with the PEL would have unintended negative effects on employee health and welfare. Employers use job rotation for such reasons as relief from ergonomic repetitive motion stresses. The proposed prohibition on job rotation to reduce exposure to respirable crystalline silica could cause employers limit common job rotation and cross-training practices that benefit employees in other regards.

In both the precast concrete plant and at the project site, workers exposed to crystalline silica may perform many job functions during a given day, some of which may entail significant but brief exposure to silica dust. Job functions vary in duration from day to day so that the measurement day may not be typical. For example, a day's production may require less than 4 hours of sandblasting, or drilling of anchor holes that may occur for very short periods. Workers need to rotate to different tasks so that precasters and erectors remain competitive against other building materials. Also, rotation could be very effective for reducing exposure.

Cleaning methods.

Prohibiting the use of compressed air, brushing or dry sweeping to clean areas where silica-containing material has accumulated is too broad. In many cases these methods of cleaning work areas are the only feasible ones available. For example, anchor holes must be blown clean to obtain adequate adhesion. This prohibition is not related to any

exposure limit or risk of increasing an employee's exposure. The use of compressed air and dry sweeping should be allowed unless the exposure will be greater than the PEL. Recently, OSHA completed air sampling and dust analysis in one of our member plants during the highest concentrations of dust (this included dry sweeping and blowing out forms). OSHA found not enough silica present to quantify. Even so, this provision would require buying HEPA vacuums for all cleaning in and around a plant. Many different sizes would be required, as some areas may be difficult to access with a vacuum. This has not been included in the cost estimates for the standard.