VIA ELECTRONIC SUBMISSION

August 18, 2014

The Honorable David Michaels, Ph.D., MPH
Assistant Secretary
Occupational Safety and Health Administration
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, D.C. 20210

Re: Docket ID OSHA-2010-0034, Post-Hearing Brief on OSHA's Proposed Rulemaking on Occupational Exposure to Respirable Crystalline Silica

Dear Assistant Secretary Michaels:

Associated Builders and Contractors, Inc. (ABC) submits the following post-hearing brief[1] to the U.S. Department of Labor's (DOL) Occupational Safety and Health Administration (OSHA) in response to the above-referenced notice of proposed rulemaking (NPRM) published in the *Federal Register* on September 12, 2013, at 78 Fed. Reg. 56274.[2]

About Associated Builders and Contractors, Inc.

ABC is a national construction industry trade association with 22,000 chapter members. ABC and its 70 chapters help members develop people, win work and deliver that work safely, ethically and profitably for the betterment of the communities in which they work. ABC member contractors employ workers whose training and experience span all of the 20-plus skilled trades that comprise the construction industry. Moreover, the vast majority of our contractor members are classified as small businesses. Our diverse membership is bound by a shared commitment to the merit shop philosophy in the construction industry. The philosophy is based on the principles of nondiscrimination due to labor affiliation and the awarding of construction contracts through open, competitive bidding based on safety, quality and value. This process assures that taxpayers and consumers will receive the most for their construction dollar.

ABC members know exceptional jobsite safety and health practices are inherently good for business. ABC understands the importance of common-sense regulations based on sound evidence and scientific analysis with appropriate consideration paid to implementation costs and input from employers. Many ABC member companies have implemented safety programs that are among the best in the industry, often far exceeding OSHA requirements.

[1] ABC filed a notice of intention to appear for OSHA's informal public hearing on December 11, 2013 [Docket ID OSHA-2010-0034-1885].

[2] ABC shares the concerns and recommendations provided in comments filed to this docket by the Construction Industry Safety Coalition (CISC) and incorporates them into this letter by reference. ABC is a member of CISC, which testified at the informal public hearing on March 24, 2014.

Background

On September 12, 2013, OSHA issued a NPRM to amend its existing standards for occupational exposure to respirable crystalline silica. Following the NPRM's public comment period end date, the agency held informal public hearings on the rulemaking in Washington, D.C.[3] The intent of the public hearings was to gather information and clarification on the rulemaking, as well as provide interested parties the opportunity to address the agency and provide evidence to the rulemaking record.

ABC's Post-Hearing Comments

As argued in ABC's comments submitted on February 11, 2014, OSHA has failed to demonstrate the proposed rule is economically[4] or technologically feasible for the construction industry. The public hearings gave OSHA the opportunity to ask the industry questions regarding feasibility, and it was demonstrated through stakeholders' testimony that many of the provisions will simply not work in the "real world" of construction.

In the NPRM, OSHA proposes to reduce the permissible exposure limit (PEL) to 50 µg/m^3 with an action level of 25 µg/m^3. In order to demonstrate the proposal is technologically feasible, the agency needs to show reaching a PEL of 50 µg/m^3 is attainable in most operations most of the time. In submitted comments and at the public hearings, contractors explained to OSHA that based on their testing, a PEL of 50 µg/m^3 simply wasn't feasible to attain in most operations most of the time.[5] The equipment that is currently available to contractors simply does not meet the standards this rulemaking requires. While there are "dustless" systems available for sale, contractors stated they have yet to experience one that is completely dustless.[6] For example, at the public hearing, a power tool manufacturer indicated he was testing his equipment at a PEL of 100 µg/m^3.[7] It is clear that OSHA's proposed 80 percent reduction in PEL for the construction industry is simply not technologically feasible.

In assessing whether reaching the proposed PEL is attainable, OSHA also must consider the scope of tasks and environments that will be affected by the proposed rule. During the hearing, OSHA raised the issue of using historical/objective monitoring data.[8] The rulemaking states that an employer may rely on historical/objective monitoring data gathered within 12 months that meets the requirements in the proposed rule instead of monitoring on a daily basis. In response to OSHA's inquiry, multiple contractors stated a prudent employer would not depend on historical/objective data. Construction environments are constantly changing, which would lead to an almost endless stream of objective data.

[3] Informal public hearings took place in Washington, D.C. from March 18 – April 4, 2014.
[4] Please refer to CISC's final economic analysis in the post-hearing comments and CISC's February 11, 2014, comments on pages 70-78 [Docket ID OSHA-2010-0034-2319].
[5] Crystalline Silica Public Hearing Transcript: March 24, 2014.
[6] Crystalline Silica Public Hearing Transcript: March 31, 2014. Testimony from Francisco Trujillo: "There is no completely dustless method that I have personally observed in the real world." Page 2960.
[7] Crystalline Silica Public Hearing Transcript: March 31, 2014. Testimony from Joel Guth; Page 2987.
[8] Crystalline Silica Public Hearing Transcript: March 24, 2014; Page 1519.

Factors that can have a significant impact on silica exposure include weather, climate and the percentage of silica dust in a given material.[9] The alternative of using historical/objective data is simply not a viable option for the construction industry because it would not guarantee the employer is in compliance.

In the NPRM, OSHA attempts to make compliance for the construction industry simpler through the use of Table 1; however, it is highly unlikely that an employer would choose to use this option as written.[10] One of the qualifications in the notes section of Table 1 is to "operate equipment such that no visible dust is emitted by the process." Again, contractors have stated real "dustless" tools do not exist on the market. Therefore, based on this reason alone, an employer would opt not to use Table 1.

Our members remain concerned with many aspects of the rulemaking, including the ancillary provisions discussed in ABC's pre-hearing comments.[11] For the reasons outlined above and in CISC's comments, ABC again urges OSHA to withdraw the burdensome proposal until it can demonstrate a rulemaking of this kind is both necessary and workable. ABC would welcome the opportunity to engage in a working dialogue with OSHA on what type of practices would work in the construction industry.

Thank you for the opportunity to submit post-hearing comments on this matter.

Respectfully submitted,

Geoffrey Burr
Vice President, Government Affairs

[9] Please refer to ABC's February 11, 2014, comments on pages 3-4 and CISC's February 11, 2014, comments pages 25-28 [Docket ID OSHA-2010-0034-2289 and Docket ID OSHA-2010-0034-2319].

[10] 78 Fed. Reg., at 56496-56499. Please refer to CISC's February 11, 2014, comments discussion on Table 1, pages 97- 115 and ABC's February 11, 2014 comments on page 7 [Docket ID OSHA-2010-0034-2319 and Docket ID OSHA-2010-0034-2289].

[11] ABC incorporates its February 11, 2014, comments [Docket ID OSHA-2010-0034-2289] into this letter by reference.

CONSTRUCTION INDUSTRY SAFETY COALITION

August 18, 2014

The Honorable David Michaels
Assistant Secretary of Labor
Occupational Safety and Health Administration
U.S. Department of Labor
Room S-2002
200 Constitution Ave., NW
Washington, DC 20210

Re: Construction Industry Safety Coalition
Post-Hearing Comments to NPRM on Occupational Exposure to Crystalline Silica
(Docket No. OSHA 2010-0034)

Dear Dr. Michaels:

I write on behalf of the Construction Industry Safety Coalition ("CISC"). CISC respectfully files the enclosed written post-hearing comments on OSHA's Proposed Rule on Occupational Exposure to Crystalline Silica, 78 FR 56274 (Sept. 12, 2013). CISC appreciates OSHA's consideration of the information and data presented in these comments.

Sincerely,

JACKSON LEWIS P.C.

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Enclosures

Construction Industry Safety Coalition
Post-hearing Brief
NPRM on Occupational Exposure to Crystalline Silica
(Docket No. OSHA 2010-0034)

I. Introduction.

The Construction Industry Safety Coalition ("CISC") respectfully files the following written post-hearing brief regarding OSHA's Proposed Rule on Occupational Exposure to Crystalline Silica, 78 Fed. Reg. 56274 (Sept. 12, 2013).

As OSHA knows, the CISC is comprised of 25 trade associations representing virtually every aspect of the construction industry. The members of the CISC are listed in Appendix A to this post-hearing brief. The CISC represents small, medium, and large contractors; general contractors; subcontractors; union and non-union contractors. Virtually every construction trade, task, and activity is represented by the member associations of the CISC.

The CISC has been an active participant throughout the rulemaking process. The CISC presented extensive pre-hearing written comments to OSHA regarding its views of the proposed rule. In developing these pre-hearing written comments, members of the CISC held several meetings and teleconferences with each other and sought specific feedback from members regarding OSHA's approach to regulating respirable crystalline silica in construction. The CISC wishes to emphasize that the comments developed and information provided are based on the specific feedback members provided to the participant trade associations.

The CISC also testified during the informal public hearings held by the Agency. OSHA devoted almost one full day to the CISC, which included testimony by Brad Hammock of Jackson Lewis P.C.; Stuart Sessions of Environomics; Kellie Vazquez of Holes Incorporated; and Kevin Turner of Hunt Construction. After presenting testimony for almost three hours, the representatives of the CISC answered questions from the public and OSHA for approximately another three hours.

Due to the compressed time frame to submit written pre-hearing comments and testimony, at the time of its written pre-hearing submission and participation in the informal public hearings, the CISC had not developed its final economic estimates of OSHA's

proposed rule. At the close of the first part of the bifurcated post-hearing comment period, the CISC submitted its final estimates of what it believes will be the costs that the proposed rule will impose on the construction industry.

The CISC's post-hearing brief is divided into several sections. Section II summarizes the CISC's position on the proposed rule, as expressed during the pre-hearing written comment period, hearing testimony, and in this post-hearing brief. Section III reiterates certain procedural objections the CISC has raised with respect OSHA's development of the proposed rule. Section IV provides comments regarding the CISC's views of additional information and argument received during the pre-hearing written comment period and hearing testimony. Finally, Section V describes the CISC's final analysis of the costs to the industry of the proposed rule (as submitted to the docket during the first part of the post-hearing comment period) and some perspective whether it is economically feasible for the industry to bear these costs.

II. Summary of CISC's Position.

OSHA is proposing to reduce the permissible exposure limit ("PEL") for respirable crystalline silica for the construction industry from the current level of 250 $\mu g/m^3$ to 50 $\mu g/m^3$. The Agency has also proposed an action level ("AL") of 25 $\mu g/m^3$, which triggers the proposed rule's exposure monitoring provisions. Exposure monitoring is just one of numerous ancillary provisions that are included in the proposal. Other provisions include requirements for regulated areas or written access control plans; prohibitions on work practices on construction sites such as compressed air, dry sweeping, and dry brushing; medical surveillance; respiratory protection; training and hazard communication; and recordkeeping.

OSHA has also proposed an alternative to the exposure monitoring provisions through the use of a table (referred to in the rulemaking as "Table 1"). Table 1 sets forth specific job activities, engineering and work practice controls, and respiratory protection that if followed, would exempt employers from compliance with the standard's exposure monitoring requirements. Table 1 is one of the lynchpins of OSHA's proposed rule for construction. OSHA's intent with Table 1 is to devise a simple compliance option for construction employers with respect to implementation of engineering controls and respiratory protection.

For construction, OSHA has preliminarily concluded that the rule is technologically feasible in ten out of twelve construction activities, with abrasive blasting and

tuckpointing/grinding being the only exceptions. The Agency also concludes that the proposal would be economically feasible, resulting in an overall annual cost to the construction industry of approximately $500 million dollars.

The CISC believes that (1) the Agency has not met its burden of demonstrating that the proposal is technologically and economically feasible, and (2) the ancillary provisions are unworkable in the construction environment.[1]

The CISC does not believe that OSHA has shown that the proposed PEL can be met by the construction industry in most operations most of the time. United Steelworkers v. Marshall, 647 F.2d 1189, 1279-1308 (D.C. Cir. 1980), cert. denied, 453 U.S. 913 (1981). OSHA's overall analysis falls short for several reasons, as the CISC explained in its pre-hearing written comments and during its hearing testimony:

- OSHA has not identified all of the construction tasks and worker job categories that would be affected by the proposed rule, nor has OSHA addressed the omitted tasks and job categories in the technological and economic feasibility analyses.

- OSHA has no justification in assuming for all construction worker exposure samples of less than full-shift duration that the sampled workers have no exposure for the unsampled remainder of their shift.

- OSHA's analysis does not consider the broad range of tasks and variety of settings and environments in which construction work occurs.

[1] The CISC also questions the overall need for the rule, as it explained in detail in its pre-hearing written comments. According to the Centers for Disease Control ("CDC"), the silicosis mortality rate in the U.S. significantly declined – by 93 percent from 1968-2007 – falling from 1,157 cases in 1968 to about 123 cases in 2007. While even one silica-related death is too many, the CDC data indicates that silica mortality is vanishing under the current PELs, including the current PEL of 250 µg/m³ in construction. NIOSH similarly reported that there has been a steep decline in silica mortality rates, noting that one of the main factors for such decline is that many deaths in the early part of its study period occurred among persons whose main exposure to crystalline silica dust probably occurred before introduction of national standards for silica dust exposure established by OSHA and the Mine Safety and Health Administration. This steep decline in deaths indicates that workers are being protected from exposure to silica and exposures are likely to continue to decrease over the years.

- OSHA's assumption about compliance on multi-employer worksites does not account for exposure effects.

- OSHA's assessment of each of the individual construction tasks analyzed failed to consider the very wide and unpredictable variations in respirable silica concentrations that can result and even if it had done so, did not demonstrate conclusively that a PEL of 50 could be met in most operations most of the time.[2]

OSHA's economic feasibility analysis understates by significant margins the true cost and impacts of the proposal on the construction industry and particularly small contractors. The CISC estimates that compliance with OSHA's proposed standard would cost the construction industry nearly $3.9 billion per year, an amount nearly eight times larger than OSHA's estimate. OSHA has grossly underestimated the costs that construction employers will incur to comply with the proposal. The CISC's more robust estimates of the cost of compliance with the proposed rule is set forth below:

Estimated Compliance Costs for the Proposed Silica Standard for the Construction Industry (in millions of 2009 dollars annually)

	OSHA Estimate	CISC Estimate
Engineering Controls	242.6	3,334.1
Program Requirements		
Respirators	84.0	108.9
Exposure Assessment	44.6	132.6
Medical Surveillance	76.0	184.6
Training	47.3	102.6
Regulated Areas	16.7	29.1
Program Subtotal	*268.6*	*557.8*
Total	511.2	3,891.9

Furthermore, the CISC's re-analysis shows that eight of the ten construction industries defined by OSHA (in its aggregated manner that dilutes and reduces the calculated impact of the regulatory costs) will face compliance costs from the proposed rule that exceed

[2] The one possible exception to this was OSHA's analysis of dry wall finishing with silica free joint compound. However, even in this instance, OSHA data showed that in a few situations exposures were above the proposed PEL.

the revenue/profits threshold typically utilized by OSHA in determining economic feasibility. The rule as proposed is economically infeasible.

The CISC appreciates OSHA's attempts to make compliance simple in construction with Table 1. Having said this, the CISC believes that Table 1 as proposed misses the mark. Table 1 is unworkable for most construction employers. Primarily, this is due to the notes included in the "Engineering and work practice control methods" section of the Table. In the view of member companies, these notes will prevent Table 1 from being utilized as a compliance option. The CISC understands that OSHA wants Table 1 to be effective and used, at least in part to avoid many of the other thorny compliance issues of the proposal and its exposure monitoring requirements. Unfortunately, what OSHA has proposed falls short of this. In addition, OSHA has decided to propose an extremely narrow "use" for Table 1. Table 1 is not a safe harbor for construction employers. It is only utilized in lieu of exposure monitoring requirements. A construction employer who opts to utilize Table 1 would still be required to ensure that all exposures are below the proposed PEL.

In its pre-hearing written comments, the CISC requested that OSHA withdraw the proposed rule and offered to engage in a dialogue with OSHA regarding what would be an appropriate approach to dealing with the hazards of crystalline silica on construction worksites. After thoroughly reviewing the rulemaking record developed by the Agency, the CISC continues to believe the Agency has not met its burden with respect to the rule and the construction industry and should withdraw the proposal.

In fact, a thorough review of the record and all of the comments received from all stakeholders – industry and labor – raises serious questions about the workability of the approach that OSHA has proposed for construction. There was virtual unanimity among rulemaking participants that OSHA needs to pursue a unique approach to construction and that the construction industry poses significant compliance challenges with respect to the regulation of crystalline silica. The comments received in the record with respect to how OSHA should address construction are very divergent, as shown below. Crafting a workable standard based on such divergent views will be extremely challenging for the Agency. With respect to the construction industry, the CISC thus recommends OSHA use this proposed rule as a "pre-proposal," analyze the comments received, and engage in dialogue with affected construction stakeholders on a constructive approach to addressing crystalline silica in construction work environments.

The CISC does not intend to revisit in this brief all of the arguments made in its pre-hearing written comments and oral testimony. The CISC hereby incorporates all of its

previous written comments and oral testimony into this brief. The CISC below addresses certain issues raised by OSHA or other commenters in the comments to the rulemaking record or the hearing that were not specifically addressed in previous CISC comments or testimony.

III. Procedural Objections.

The CISC continues to object to certain aspects of OSHA's development of the proposed rule. In the preamble to the proposal, OSHA described its history with respect to crystalline silica and the development of the proposal. While OSHA started pre-rule actions related to crystalline silica in the early 1970s, it did not start working earnestly on a rulemaking until the mid to late 1990s.

As stated in the CISC's pre-hearing comments, OSHA's relative regulatory inactivity coincided with a steep decline in the incidence of silicosis, as shown by Centers for Disease Control ("CDC") data. Despite the downward trend in silicosis deaths, the Agency concluded that a comprehensive rule was needed to address silica exposures in general industry, maritime, and construction. OSHA's crystalline silica rulemaking thus became a standard entry on OSHA's Unified Regulatory Agendas starting in the late 1990's.

The CISC continues to have two objections to the process undertaken by the Agency over the span of the last several years to develop the proposed rule. First, the CISC objects to OSHA's reliance on a Small Business Regulatory Enforcement Fairness Act ("SBREFA") process convened a full decade before promulgation of the proposed rule. While a few provisions of the draft proposed standard put forth during the SBREFA process were the same as the proposed rule, much is different including – importantly – Table 1. Table 1 in the proposed rule is bifurcated with respect to respiratory protection and the number of hours worked, which Table 1 in the draft proposed rule was not. Table 1 in the proposed rule also contains many additional prescriptions as to how the control methods are to be used (e.g., "no visible dust"), which were not included in the draft proposed rule's Table 1 and which, in our view, make the current version of Table 1 impractical as a compliance option for construction work.

Table 1 is a critical aspect of the proposed rule for the construction industry, in OSHA's view and in the view of virtually every interested stakeholder (industry, labor, public health) during the rulemaking proceedings. As the CISC stated in its pre-hearing written comments, Table 1 is so important that OSHA presumes for purposes of its economic analysis that construction employers will follow Table 1 as a compliance option. Unfortunately, the Small Entity Representatives ("SERs") did not have an opportunity to

provide feedback to OSHA on what it has proposed as Table 1 here. Having SERs comment to OSHA on the current Table 1 may have prevented the compliance difficulties that CISC believes will prevent construction employers from utilizing Table 1 at all.

Second, the CISC feels strongly that OSHA did not fulfill its requirement to consult with the Advisory Committee on Construction Safety and Health ("ACCSH") in advance of issuing the proposed rule. As the CISC stated in its pre-hearing comments:

> While the CISC appreciates that OSHA approached ACCSH regarding the draft proposed rule that was put forward to the SERs during the SBREFA process, the CISC respectfully asserts that this interaction did not fulfill the requirement that OSHA consult with ACCSH on proposed construction rules.
>
> OSHA's procedural regulations regarding the commencement of rulemaking for construction standards states that OSHA must "provide [ACCSH] with any proposal" of its own, along with all pertinent factual information available and ACCSH must submit recommendations back to OSHA within the time frame allotted for same. 29 CFR 1911.5.
>
> In this instance, OSHA did not provide a copy of its "proposal" or anything similar. OSHA essentially provided a copy of the draft proposed standard submitted as part of the SBREFA process, but as stated above that was significantly different from the proposed rule ultimately issued. The draft proposed standard given to ACCSH did not even specifically indicate that OSHA was going to propose a PEL of 50, instead alluding to proposed PELs of 50 and 100. As important, the draft proposed standard never contemplated an AL for silica for construction if the PEL were set at 50. ACCSH was never asked to comment on the appropriateness of an AL of 25.

CISC Pre-hearing Comments, pp. 16-17.

OSHA's own requirements mandate submission of a proposal that incorporates the main requirements of what is ultimately published in the *Federal Register*. In this instance, at a minimum, that would include (1) the actual proposed PEL, (2) the fact that there is an AL of 25 $\mu g/m^3$, and (3) the proposed Table 1, including the "Notes." In the CISC's view, by failing to do this here, OSHA has failed to comply with its own procedural regulations.

There was little to no dispute during the public hearing process regarding ACCSH's review of OSHA's proposal. To be sure, there was testimony from former members of

ACCSH regarding ACCSH's overall involvement with silica throughout a several year period. But, the Committee's overall involvement with an issue does not satisfy OSHA's legal obligation to provide ACCSH a copy of the "proposal" and supporting material. OSHA's procedural requirements envision a substantive consultation process with ACCSH before the issuance of a proposed rule. This substantive consultation involves more than just a general discussion of a proposal or a discussion of different approaches to addressing a particular hazard on construction worksites. It involves providing "the proposal" and supporting materials and soliciting comments on "the proposal" and supporting materials. OSHA failed to do this here.

IV. Post-hearing Arguments.

As stated above, the CISC is not simply reiterating its pre-hearing comments or hearing testimony in this submission. The CISC's overall view of the rulemaking record is that the record – examined as a whole – supports the arguments made by the CISC in its pre-hearing comments and hearing testimony. There was some evidence introduced into the record, however, that the CISC wishes to highlight in this submission, as the evidence is particularly valuable in underscoring the CISC's views of the proposed rule. This evidence is discussed below.

A. NIOSH testimony demonstrates that OSHA must show that it is technologically feasible to reduce worker exposures below at least 25 µg/m^3 in the construction industry, not simply below 50.

In the CISC's pre-hearing written comments, it questioned the extent to which the Agency had fully considered the variety of exposure conditions, operations, and environments in the construction industry in determining whether a PEL of 50 µg/m^3 was technologically feasible:

> [I]t is incumbent upon the Agency to broaden the data upon which it is relying and incorporate assumptions that reflect the variety of tasks performed on construction sites and the different environments in which the tasks are performed . . . . [The Agency must] thoughtfully examine the extent to which construction contractors across the United States performing work in a number of different scenarios and environments can reach the proposed PEL and AL in most of their operations most of the time.

CISC Pre-hearing Comments, p. 27.

Throughout the preliminary economic analysis ("PEA") OSHA relies on samples indicating that the PEL may be reached, but these samples are not necessarily reflective of actual exposure conditions that construction employers face on a day-to-day basis. In addition, the PEA failed to show that any of the control methods identified by OSHA could reach an AL of 25 µg/m^3, with the exception of drywall finishing using silica-free joint compound. Even if OSHA were correct that an employer could reach a PEL of 50 µg/m^3 in most operations most of the time (which the CISC does not believe OSHA has shown), OSHA has never shown that an employer could reliably reach below those levels.

During the public hearing on the proposed rule, the National Institute for Occupational Safety and Health ("NIOSH") testified on several points. In general, NIOSH was supportive of the proposed rule. At the same time, NIOSH's testimony pointed out several aspects of the construction environment that support the CISC's pre-hearing comments and hearing testimony and that OSHA must consider before promulgating any crystalline silica rule for construction.

NIOSH testified that the variable nature of the construction industry and the performance of construction tasks present very complex compliance challenges. NIOSH advised OSHA to tailor silica standards for construction, noting that "unlike other industries where production conditions are relatively similar day-to-day, construction conditions change as the building project progresses." Tr. 3579, 129.[3] According to NIOSH, "various construction-related factors can impact exposure levels, including the type of tasks, tools, and controls and other nearby dust sources, the open or closed nature of the task location, and the maintenance of equipment and controls." Id. This is precisely the point that the CISC has been making throughout the rulemaking process. The CISC testified to additional factors that contribute to hugely varying exposures across work shifts even when the same construction worker performs the same task – tremendous variation in the amount of time during his shift when the worker performs the task, ranging from several minutes to a full shift, and in the silica content of the material on which the work is performed, ranging from nearly zero to nearly one hundred percent.

NIOSH went further in its testimony, however, and stated that in order for a construction employer to ensure compliance at all times with the proposed PEL of 50 µg/m^3, that employer would have to ensure compliance on an average basis with a much lower exposure limit:

[3] Citations to the transcripts of the informal public hearings include the four-digit document number identifier and page number, which can be found at www.regulations.gov at OSHA Docket OSHA-2010-0034-XXXX.

> [A construction employer would need to get at] or below the action level depending on how variable my environment is . . . . If I'm very well controlled and tight, and I've got data that shows that I'm always 70 percent of the occupational exposure limit, and I know that it doesn't vary much at all, I could operate there, but if it's bouncing around a good bit, I want to be sure that 95 percent of my measurements come in under the limit.

Id. at 189.

According to NIOSH, a prudent employer must control exposures on average to the AL or below in order to ensure compliance at all times or nearly all times (e.g., 95%) with a PEL. This is due to the unique and variable nature of construction *vis-à-vis* respirable crystalline silica dust. Unfortunately, OSHA has not considered this in its technological feasibility analysis. The CISC respectfully asserts that the rulemaking record does not support that construction employers can meet a lower exposure limit in most construction operations most of the time.

The real effect of this can be seen in a hypothetical OSHA enforcement action under the proposed rule. Regardless of past exposure monitoring data or objective data relied upon by an employer to justify implementation of controls on a covered construction operation, when an OSHA compliance officer comes on site and performs sampling of the operation, if the exposures in that circumstance are above the PEL, a citation will be issued. It does not matter that previously some sampling had indicated exposures below the PEL under different conditions. On that particular day, the *variable* conditions in construction caused the exposure to be above the PEL.

To avoid this from happening, employers must implement controls to reduce exposures to significantly below 50 $\mu g/m^3$, as NIOSH testified. Construction employers cannot rely upon local exhaust ventilation ("LEV"), for example, to get them to the PEL in most operations most of the time. They must rely on LEV or other controls to get them to a lower level – the AL according to NIOSH – because they know that when used in a variable construction environment, exposure levels will likely be higher.

What OSHA has failed to do with the proposed rule is demonstrate that the controls examined will get employers to these low levels. In fact, the CISC believes and has shown that OSHA has not met its burden of showing construction employers can reach the proposed PEL of 50. NIOSH's testimony provides another important consideration for the Agency as it determines how to proceed with the proposed rule.

B. The rulemaking record shows the unpredictability and variability of silica exposures on construction worksites.

Further to the above, if there is one piece of evidence that is virtually undisputed in the rulemaking record, it is that respirable crystalline silica exposures in the construction environment are highly unpredictable and variable. In addition to the NIOSH testimony above, the record is replete with testimony of how unpredictable and variable is the construction environment:

- "As far as the four hours goes, typically, you know, you've got some sense of what you're going to be doing that day, but because the variable nature of any construction site, there's . . . it's not beyond reason to expect, I was going to be in here working on that wall today, but something came up short. The pipe fitter has to get in here ahead of me or whatever. So that changes what I'm doing, and then there's a domino effect or there can be where, because I'm not done in here tomorrow, then that sets somebody else back. So there is that variability there." Tr. 3581, 1684 (Deven Johnson).

- "As it pertains to the biggest obstacle for the proposed PEL, I think it's going to be feasibility. We've done testing that shows that a hundred is difficult. And I don't ever remember seeing any data for any of our guys that were – that was under 25. We're worried that this is going to be an impossible standard to meet because of the transient environment and the constantly changing environment of construction. So I think our biggest obstacle is there's far too many variables. It's a one-stop shop for all of construction and it's going to be difficult, if not impossible, to meet a PEL – an action level of 25." Tr. 3585, 2938 (Rashod Johnson).

- "As I said, my name's Daniel Anna. I'm Vice President of the American Industrial Hygiene Association, certified industrial hygienist, certified safety professional, and have been involved in occupational safety and health for nearly 25 years . . . . The AIHA endorses the concept at Table 1, and the options it provides to the construction contractors. Although AIHA encourages air monitoring as an important part of an overall worker exposure assessment program, the reality is that potential worker exposures on a construction site are

> constantly changing. By the time samples are collected and analyzed, tasks may have been completed and workers have disbursed to other jobs, which may minimize the usefulness of monitoring results." Tr. 3578, 1038 (Daniel Anna).

The import of this is significant, both from a legal perspective *and* a compliance perspective. From a legal perspective, OSHA must consider the variability when determining whether reaching a PEL of 50 is capable of being done. The discussion above underscores this as it relates to the proposed PEL. In the CISC's view, OSHA cannot conclude that the proposed rule is technologically feasible based on the limited data set it used to find feasibility in the PEA. In addition, the variable and unpredictable nature of silica exposures in the construction environment must be robustly considered in the economic analysis of the Agency. On any given day or any given job, varying degrees of exposure to respirable crystalline silica can occur, which influences how the Agency should make assumptions about employer behavior if OSHA were to go forward with the rule, as proposed.

From a compliance perspective, the unpredictability and variability of silica exposures on construction worksites make compliance particularly challenging for construction employers. This is, of course, one of the reasons why OSHA proposed Table 1 in the standard – to provide some certainty to construction employers with respect to compliance with certain aspects of the standard. As set forth below, the CISC continues to believe that Table 1 is not workable and will not be utilized by construction employers.

The unpredictability and variability of exposures also has a significant impact on the ability of employers to utilize historical or objective data in lieu of exposure monitoring. During the public hearings there was testimony regarding the extent to which exposure monitoring would ever be performed by construction employers either because of the use of Table 1 or the use of historical or objective data. As the CISC said in its pre-hearing written comments and in its testimony, because of the nature of crystalline silica on construction worksites and the variability and unpredictability of exposure, exposure monitoring will have to be an ongoing exercise:

> I see for Holes, Incorporated to be able to comply, I would think that we would have to continuous[ly] monitor. So that would be monitoring each one of my employees every single day for an eight-hour time weighted average. So I would think an industrial – hiring an industrial hygienist I would think the daily, for my 24 operators, doing daily monitoring of their activities.

Tr. 3580, 1423 (Kellie Vazquez).

As the CISC also stated during the hearings:

> I think the idea of characterizing an employee's exposure with a single or a few samples is not sensible for the construction industry. The variation can be so great and so unpredictable that virtually any employee has some possibility, some likelihood of, in fact, being exposed above the proposed PEL on some day during the year when he's proposing the task.

Tr. 3580, 1446 (Stuart Sessions).

The CISC recognizes that there will always be unpredictability and variability on construction worksites and that such unpredictability and variability are not reasons – in and of themselves – to avoid regulating health hazards in construction. Notwithstanding this, given how ubiquitous crystalline silica is on construction worksites (virtually everywhere and in everything), the unpredictability and variability concerns are much greater with respect to crystalline silica than in previous regulatory initiatives of health hazards on construction sites. The Agency must do more than pay lip service to the unpredictability and variability – it must truly factor this in to its feasibility analyses and its approach to the proposed PEL, Table 1, and the other ancillary provisions.

C. <u>The additive effects of multiple silica generating tasks occurring simultaneously on multi-employer worksites must be considered.</u>

In its pre-hearing written comments, the CISC noted that OSHA's technological feasibility analysis did not fully reflect the additive effects of silica generating tasks on multi-employer worksites. The underlying analysis performed by OSHA's contractor (Eastern Research Group or "ERG"), in fact, assumed no secondary exposure sources for silica when construction employees are on multi-employer sites. As the CISC stated:

> There are multiple problems with ERG's thinking on this issue. The CISC does not believe it is reasonable to assume full and effective control throughout a construction work site after the rule is finalized, given the extent of non-compliance with OSHA's current PEL. Even if this assumption were correct, however, ERG's conclusion that secondary exposure would be "eliminated" makes no sense: if all silica-generating tasks are controlled below 50 $\mu g/m^3$, secondary or tertiary silica-generating tasks will likely still contribute to exposures that employees are receiving.

> By way of example, let's assume that a grinder at a worksite may generally reach a PEL of 45 µg/m^3 in certain circumstances with no other silica generating activities around. Performing this same operation adjacent to three other grinders also at 45 µg/m^3 may significantly affect the exposures that an employee actually experiences. Employers will need to consider all of this information when establishing engineering and work practice controls to protect employees. In effect, to ensure compliance, employers will need to make certain worst-case assumptions of exposure – based on an examination of likely exposures from the particular job task *and* exposures from other workers at a job site.

CISC Pre-hearing Comments, p. 29.

The rulemaking record is replete with additional evidence of how frequently construction contractors are performing silica generating tasks alongside other construction contractors. For example, Kellie Vazquez testified that it is a very common occurrence:

> Q: So this question is more for Ms. Vazquez then. How often do you find yourself working while you are generating silica where there are other contractors on the site who are also performing silica-generating operations? Is that a frequent occurrence for you all?
>
> Ms. Vazquez: Yes, it is. It does happen often. There are some times that we will be called out to a job and there will be, you know, we're always working for somebody, so there is always a second contractor there. But most of the time, it is a multi-employer site with several different trades.

Tr. 3580, 1454-55 (Kellie Vazquez).

OSHA must adjust its assumption related to the additive effects of exposure to meet its burden of showing technological feasibility. OSHA cannot meet its burden of demonstrating technological feasibility by assuming that in all cases there will be no secondary silica dust that impacts exposure.[4]

[4] The CISC does not dispute that OSHA must make certain assumptions regarding employee exposure when deriving technological and economic feasibility conclusions. The CISC notes, however, that OSHA's assumptions do not reflect the realities of the construction work environment, realities that OSHA rhetorically acknowledges. Furthermore, combining these faulty assumptions (e.g., no secondary exposure and no exposure after sampling for non-full shift

D. Comments in the record related to effectiveness of engineering controls in the construction environment do not quantify that effectiveness.

OSHA's obligation to prove technological feasibility is driven principally by demonstrating that the proposed PEL can be met without regard to the use of respirators.[5] This, of course, is consistent with the Agency's historical reliance on a "Hierarchy of Controls" to protect employees from health hazards. The use of engineering controls to reach compliance with the proposed PEL is the crux of the Agency's burden with respect to showing technological and economic feasibility.

The CISC has stated repeatedly that it is OSHA's burden to show that implementation of controls can reach the *proposed PEL* in most operations most of the time. This is the standard that OSHA must meet. It is not sufficient for the Agency to meet its technological feasibility burden by demonstrating that various control measures may reduce exposures to a level below that of exposures without the use of controls.

Throughout the rulemaking process, several stakeholders asserted in writing and oral testimony that certain engineering controls in the construction environment – without dispute – reduce exposures to silica. These control methods are widespread and simple, in the words of these commenters:

- "The use of these control measures not only controls dust at the source, but also prevents exposure to other trades. If all trades use engineering control measures, the dust can be controlled at the source, and workers and bystanders are protected." Tr. 3581, 1590 (Charles Austin).

- "There are a number of simple control measures that can be taken to effectively reduce the amount of airborne silica. Tools causing dust, such as grinders and saws, should be fitted with water attachments and dust extraction devices. . . . When grinding concrete or other masonry materials, a shroud with a vacuum attachment should be used. Vacuums with HEPA

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samples) skews in a significant way OSHA's preliminary finding that a PEL of 50 can be reached in most construction operations most of the time.

[5] OSHA's failure to demonstrate that the PEL can be met without regard to the use of respirators is highlighted by the proposed Table 1. As the CISC stated in its pre-hearing written comments, eight of the 13 operations included in Table 1 require some form of respiratory protection under certain conditions of use. This heavy reliance on respiratory protection undercuts OSHA's conclusion that a PEL of 50 is technologically feasible with the use of engineering and work practice controls alone.

filters are the preferred method for collecting dust. If dry grinding is performed, regular vacuuming and wet sweeping of floors will also help to remove settled dust during these operations." Tr. 3581, 1561-62 (Gerry Scarano).

- "At World of Concrete, there are -- you know, each year, there seem to be more and more types of tools coming out that control silica. You know, one manufacturer just came out with a hollow drill bit that, you know, suctions in the dust right there as you're going in as the hole is being drilled. So new innovations keep happening." Tr. 3581, 1673 (Eileen Betit).

- "We don't have to reinvent the wheel here. Those tools are available to the industry right now. Industry will tell us that it's cost-prohibitive to use those tools. . . . They'll say that, and they have said, that the setup time of using those tools is prohibitive. Those tools come integral with all the things you need to collect the dust built into them. There's nothing more complicated or time consuming than plugging the device into a wall and turning it on and using the tool." Tr. 3581, 1592-93 (Deven Johnson).

- "The control systems are simple. . . . And it's as simple as – it's not much more complicated than changing a bag on your vacuum at home. It doesn't take a ton of training to learn how to do that. . . . [T]he systems are pretty simple. So I would say that it would be fairly easy and in most cases just as simple as showing someone how to do it and providing whatever it is they need to do that." Tr. 3585, 3100 (Tom Ward).

The CISC appreciates comments such as those above. The CISC does not dispute that the use of wet methods or local exhaust ventilation can reduce silica exposures if used correctly. But, merely stating that the use of engineering controls is effective at reducing silica dust generation does little to satisfy OSHA's technological feasibility burden. It is not enough to conclude that certain engineering controls reduce dust or are "effective" at reducing a significant percentage of crystalline silica in a particular work environment. To show technological feasibility, the Agency must conclude that the controls can reach the specific proposed PEL. The evidence in the record simply does not support that.

For the same reasons, exposure data points submitted to the Agency, or used by the Agency, with little or no description of the circumstances surrounding how the data points

were derived, is of little to no value in making conclusions of technological feasibility. In determining whether a particular exposure sample is reflective of certain conditions on a construction worksite, at a minimum OSHA must know: (1) the construction activity performed; (2) the environmental conditions that existed at the time the sample was taken including temperature, humidity, and moisture; (3) whether other silica-producing construction activities were being performed nearby and what the wind direction was at the time the sample was taken; (4) what the silica content was of material being disturbed during the work activity; (5) the area of the country the activity was being performed to the extent that geographic location influences background silica content; and (5) what specific type of control method (if any) was being used.

OSHA must look carefully at all of the data submitted to the record and determine if the data points are sufficiently representative of the variety of exposure conditions to make a judgment that the PEL can be met in most operations most of the time. The CISC's view of the data is that it does not meet this high standard.

E. Testimony from iQ Power Tools provides further evidence that a PEL of 50 is technologically infeasible.

While there was significant qualitative testimony that certain engineering controls can reduce exposures to crystalline silica, there was little quantitative evidence submitted to the record and virtually none that included the exposure detail set forth above. The testimony of iQ Power Tools was particularly instructive, however, in demonstrating the difficulty that construction employers will have in reaching the proposed PEL of 50.

iQ Power Tools is a pilot company for silica exposure reduction. It boasts a 90 percent dust filtration system and widely adaptable models for a majority of their products. The company has developed a line of high-quality power tools that has been rigorously tested:

> We have tested, and we continue to do testing, and we're doing perimeter testing and operator testing on these at – for what duration, how long you can run them and what the exposure limits are – for the different materials. And also verifying the different silica contents in the different materials we're cutting.

Tr. 3585, 2987-88 (Joel Guth).

Despite the engineering work that has been put into designing the iQ line of power tools, the company testified that even at a PEL of 100 µg/m^3, there was no assurance its tools could meet that level. In fact, in response to a question asking whether a contractor using one of iQ Power Tool's products would need to aim for a lower level due to the differences in silica content in order to be in compliance with the 100 µg/m^3, Mr. Guth replied:

> Yes. You would need to know what it is but also, you know, what we've seen by testing is that we can use certain ranges for certain types of material. Brick seems to be lower, and concrete masonry units seem to be a little bit higher, so if you're using somewhere around a 20 to 23 percent, you're going to know approximately how many cuts you can make and still maintain that level.

Id. at 2989-90.

Interestingly, iQ Power Tools did not support a reduced PEL of 50, instead stating that a PEL of 100 µg/m^3 would be the most realistic target. Even iQ Power Tools, an advanced construction tool company, does not believe the proposed PEL of 50 µg/m^3 is technologically feasible.

F. The record shows significant obstacles to the use of wet methods on construction worksites.

The Agency relied heavily in its technological feasibility analysis on the use of wet methods. For construction activities, the two primary engineering control methods were use of wet methods or local exhaust ventilation systems. The CISC provided extensive comments regarding concerns related to the effectiveness of wet methods in certain construction environments:

> [W]et cutting is ineffective when there is not ready access to water. On many new home construction projects, there is no running water in or around the worksite until very late in the construction process, right before occupancy when the water meter is installed. Thus, employers would be required to bring their own large tanks filled with numerous gallons of water or regularly stop work in order to find a ready water supply – both are costly and time consuming propositions. The use of wet-cutting methods for a remodeling home project is equally impractical if the cutting, for example, must be performed inside the home as such water could damage existing floors, drywall, or the home owner's possessions. In addition, using wet-cutting

> methods outside can create slurry that can flow into storm drains, potentially violating environmental regulations.
>
> Moreover, using wet-cutting methods in winter has not been fully studied by OSHA for feasibility. There are many places within the United States, where the use of water, outside in the dead of winter, would not only be ineffective at reducing silica exposure because the water would immediately freeze but, also, because it could create pockets of ice that employees and others could slip on.

CISC Pre-hearing Comments, pp. 94-95.

Several stakeholders questioned the extent to which contractors could not utilize wet methods in certain environmental conditions. Some testimony in the record suggested that water can always be used to control for silica. These commenters asserted that if temperatures ever reached levels where water could not be used as a control measure, the construction jobs would be halted because of the cold. In other words, according to these commenters, whenever construction work is being performed, it will be warm enough to utilize wet methods.

The CISC disagrees with these commenters. First, even OSHA's contractor, ERG, stated in its report for the PEA that there are certain times that wet methods cannot be used due to weather conditions. Second, several other commenters, including Kevin Turner from Hunt Construction, confirmed that weather and environmental conditions can serve as obstacles to utilizing wet methods, particularly in the northern part of the country.

Furthermore, those commenters suggesting that wet methods can be used in all circumstances to control silica exposure did not address the additional points raised by the CISC regarding the other times that wet methods would not be permitted to be introduced into a construction environment. As Kevin Turner stated during the hearings:

> I'm sure you were part of the winter we just went through or are coming out of according to the calendar. Minus 10, static temperature with minus 40 wind chills isn't conducive to putting water or other fluids on the job site. Beyond that, we do run into a lot of high end finishes, four and five star hotels, even government buildings, believe it or not, where the architects prefer we not wet cut because they don't want water standing on their materials that they are finishing out. And that could be everything from countertops to cornerstone of the buildings.

Tr. 3580, 1457 (Kevin Turner).

The CISC does not dispute that properly using water as a control measure can reduce silica dust and, potentially, employee exposures to respirable crystalline silica. Use of water, however, will not necessarily reduce silica exposure to below the PEL, as stated above. In addition, contractors cannot use wet methods for all operations at all times. OSHA must fully consider this when determining whether it is technologically feasible to reach a PEL of 50.[6]

G. The rulemaking record shows that OSHA must completely re-think Table 1.

The CISC continues to be appreciative of OSHA's efforts to try to make a simple compliance option – Table 1 – for construction employers. There was broad consensus during the hearings that if OSHA were to publish a final rule for construction, some form of Table 1 would be needed.

Despite this, the rulemaking record shows almost universal concerns with how Table 1 is currently constructed – both from labor and industry points of view. In the CISC's pre-hearing comments and testimony, the CISC explained its concerns with how OSHA has crafted Table 1. It requested that OSHA start anew with Table 1, engaging stakeholders directly in the effort to craft a workable alternative to OSHA's traditional rulemaking approach to health hazards.

The CISC's recommendation is underscored by the wide range of comments and views presented to OSHA throughout the rulemaking process on Table 1. In addition to the CISC's views, commenters stated:

- Table 1 should be expanded to include more tasks;

- Table 1 is analytically inconsistent in that it includes job activities (e.g., tuckpointing) with job tasks (e.g., using jackhammers);

[6] In addition, the CISC does not believe that OSHA has fully considered from a cost perspective additional measures that contractors will need to take to fully comply with federal, state, and local environmental laws related to silica-containing slurry from the use of wet methods. Employers must follow a variety of environmental laws and permitting regulations when this slurry is created. To the extent employers will need to utilize *more* water on job sites, this could lead to a greater amount of waste generation, triggering additional environmental compliance and permitting obligations.

- Table 1 must include the "Notes" to ensure that controls are operating correctly; and

- Table 1 must not "freeze" technology and should be frequently updated.

All of these comments have some merit, but some are inconsistent with each other. The rulemaking record includes a great deal of comment on Table 1, but very little consensus on how Table 1 should "look." If OSHA truly wants to include a Table 1 in any rule that will work *and* actually be utilized by construction employers, it must initiate a new effort to engage stakeholders around a table and develop some approach that melds the comments above, as well as those other comments raised during the rulemaking. The CISC would fully support such an effort and would be willing to actively participate in these discussions.

H. Not providing employers a copy of medical surveillance results unlawful and counter to employee safety and health.

As OSHA has done with virtually all of its previous health standards, in the proposed rule the Agency put forth extensive medical surveillance provisions. Under proposed paragraph (h)(1), OSHA requires that employers provide medical surveillance at no cost to employees, and at a reasonable time and place, for each employee who will be occupationally exposed to respirable crystalline silica above the PEL for 30 or more days per year.

In its pre-hearing written comments, the CISC addressed the proposed medical surveillance provisions. The CISC believes that medical surveillance with respect to crystalline silica in the construction industry is impractical, in light of the transient nature of the workforce, the turnover rate in the construction industry, and the extent to which employees are exposed to at least some level of silica in the construction environment. CISC Pre-hearing Comments, p. 116.

Under proposed paragraph (h)(5), the employer must obtain a written medical opinion from the health care provider ("HCP") within 30 days of each medical examination performed on each employee. The written opinion must contain: (1) a description of the employee's health condition as it relates to exposure to respirable crystalline silica, including the health care provider's opinion as to whether the employee has any detected medical condition(s) that would place the employee at increased risk of material impairment to health from exposure to respirable crystalline silica; (2) any recommended limitations upon the employee's exposure to respirable crystalline silica or upon the use of personal protective equipment; (3) a statement that the employee should be examined by an American Certified

Specialist in Pulmonary Disease if the chest X-ray provided in accordance with this section is classified as 1/0 or higher by the "B" reader, or if referral to a pulmonary specialist is otherwise deemed appropriate by the health care provider; and (4) a statement that the health care provider has explained to the employee the results of the medical examination, including findings of any medical conditions related to respirable crystalline silica exposure that requires further evaluation or treatment, and any recommendations related to use of protective clothing or equipment. In the preamble to the proposed rule, OSHA provides its rationale for including this proposed provision:

> The purpose of this requirement is to provide the employer with a medical basis to aid in the determination of placement of employees and to assess the employee's ability to use protective clothing and equipment. OSHA believes the 30-day period will provide the PLHCP sufficient time to receive and consider the results of any tests included in the examination, and allow the employer to take any necessary protective measures in a timely manner. The proposed requirement that the opinion be in written form is intended to ensure that employers and employees receive the benefit of this information.

78 Fed. Reg. 56274, 56472.

Amongst other problems with the proposal's medical surveillance requirements, in pre-hearing comments the CISC expressed concerns with respect to the notification provisions:

> It is also not clear what an employer and employee are supposed to do if an employee does show early signs of silicosis or a lung disease, especially if the employer has already implemented necessary engineering and work practice controls and respirator use. There is no medical removal requirement in the rule and, if the employer were to remove someone from the working environment, it could be exposing itself to potential liability under other employment laws and regulations.
>
> In addition, there is the potential that employers will refuse to hire individuals who are classified as 1/0 or higher on their chest X-ray because of the potential workers' compensation or private civil litigation liability that they could be exposed to in the event they hire the individual and the disease progresses. The employer will be faced with the decision to hire a worker and face the potential liability that may come from further exposing a susceptible worker to

> respirable silica or not hire the individuals and be subjected to a claim under other employment statutes and regulations.

CISC Pre-hearing Comments, p. 117.

The requirement to provide the employer a copy of the HCP's written opinion was controversial with many stakeholders, in addition to the CISC. Some stakeholders advocated that OSHA require employers to provide medical surveillance to employees, but that the written opinion not be transmitted to employers. These stakeholders were concerned that employers would refuse to hire or terminate employees if they learned that the employees showed signs of silica-related disease:

> There is great concern that employers will use medical information to retaliate against workers or blacklist them from future employment (particularly in the construction industry) in an effort to reduce obligations under the standard or workers' compensation or disability costs.
>
> It is time for OSHA to bring the medical confidentiality provisions of its standards up to date and to protect workers' confidentiality and privacy. To this end, the AFL-CIO recommends that OSHA adopt an approach to the provision of medical information to employers that follows the approach contained in the regulations governing medical information under the Black Lung Program. (30 CFR 90.3) Specifically we recommend that the final standard require that the PLHCP's written opinion be provided directly to the employee by the PLHCP. The written opinion or other information from the medical examination should only be provided to the employer at the initiation by and with the written consent of the employee. The only information that should be provided directly to the employer by the PLHCP to the employer is a determination that the employee is unable to wear a respirator.
>
> Moreover, we strongly urge OSHA to include provisions in the final standard that explicitly prohibit the employer from asking the employee or the PLHCP for a copy of the medical information, as is included in the black lung regulations, and a prohibition against an employer for retaliating or taking any adverse action against an employee based [on] the employee's participation in the medical surveillance program or upon the results of any medical examination or tests conducted in the surveillance program.

AFL-CIO Pre-hearing Comments, p.18.

While the CISC shares some of the same concerns as these stakeholders, for several reasons it does not support the solution of these stakeholders, which would be to require medical surveillance but deprive employers the right to know of the results as it relates to workplace exposure to respirable crystalline silica.

The CISC respectfully believes that OSHA lacks the legal authority to promulgate such a requirement. In past OSHA standards, the Agency has included medical surveillance for the purpose of, in part, allowing employers to understand the effects that hazards in the work environment are having on the health of employees. Providing employers this information allows them to make changes to the work environment or in certain circumstances remove affected employees from exposure. The key aspect is that employers take the information gleaned from surveillance and apply it to the worksite, which can improve the safety and health practices of same. The purpose of medical surveillance is <u>not</u> to mandate that employers pay for ongoing medical diagnosis and treatment with no nexus to the workplace.

In fact, Section 4(b)(4) of the Occupational Safety and Health Act of 1970 ("OSH Act" or "Act") prohibits OSHA from infringing on state workers compensation systems: "Nothing in this Act shall be construed to supersede or in any manner affect any workmen's compensation law or to enlarge or diminish or affect in any other manner the common law or statutory rights, duties, or liabilities of employers and employees under any law with respect to injuries, diseases, or death of employees arising out of, or in the course of, employment." 29 U.S.C. 653(b)(4). OSHA's medical surveillance provisions have withstood previous challenges based upon Section 4(b)(4) precisely because the employer is informed of the medical conditions of employees as it relates to worksite exposure. Without a nexus with the worksite, medical surveillance requirements are not reasonably necessary and appropriate.

In addition, depriving employers of necessary health information as it relates to silica exposure in the workplace puts employers in the position of – potentially – continuing to expose employees to respirable crystalline silica after they are showing signs of silica-related health effects. It also deprives employers of critical information that could be useful in adjusting or implementing new controls in the work environment. Furthermore, employers cannot make needed workers compensation notifications if they are deprived of this information.

As the CISC stated at the outset of the rulemaking process, OSHA's historical medical surveillance requirements simply do not work *vis-à-vis* crystalline silica. There are numerous problems of adopting those requirements to this proposed rule. However, the

recommendation made by stakeholders to require medical surveillance but deprive employers of information stemming from the surveillance is not a recommendation that OSHA has the authority to adopt, nor is it a recommendation that will further safety and health for construction employees.

I. Comprehensive training obviates the need for a written access control plan or competent person training requirements.

OSHA included certain training requirements in the proposed rule. Paragraph (i)(2) of the proposal requires employers to ensure that each affected employee can demonstrate knowledge of: (1) specific operations in the workplace that could result in exposure to respirable crystalline silica; (2) specific procedures the employer has implemented to protect employees from exposure to respirable crystalline silica, including appropriate work practices and use of personal protective equipment; (3) the contents of the rule; and (4) the purpose and a description of the medical surveillance program.

In its pre-hearing comments, the CISC generally supported the training requirements proposed:

> The CISC also supports the requirement that employees be trained on the specific operations that would result in exposure to respirable crystalline silica and the methods implemented by employers to reduce said exposure, including appropriate work practices and the use of personal protective equipment. Providing comprehensive training on these items is an effective means of protecting employees. In addition, the CISC supports the requirement that employers provide employees with an opportunity to ask questions of a qualified person during training. The CISC would also agree to document that training has been received and that employees have demonstrated knowledge of said training. Finally, the CISC supports the performance-oriented basis for this requirement and OSHA's recognition that employers are in the best position to determine how their employees will be trained.

CISC Pre-hearing Comments, p. 121. In fact, the CISC believes that thorough training of employees, as described above, obviates the need for OSHA to include requirements for a written access control plan or additional competent person training.

The CISC believes that all employees on a construction site with potential exposure to respirable crystalline silica need to be trained in the areas identified above. A key component of this training involves understanding operations that could result in the release

of airborne respirable crystalline silica. Employers should not simply rely on a competent person or a written plan to instruct employees as to the location of silica generating activities. Instead all employees should have this training and make the on-site determinations based on same.

Several stakeholders in particular argued that competent person training should be expanded and that competent persons should be given expanded roles under the standard:

> Competent persons can help ensure controls are being used effectively and know how and when to call in a qualified person (e.g., an industrial hygienist) for more complex or unusual scenarios. The use of a competent person is also a way to ensure that workers with potential exposures to silica dust get the training they need to protect themselves. As the silica proposal rightly places a heavy emphasis on the proper use of controls, and exposures can vary greatly if controls are not used properly, a competent person is essential to ensure their proper use.

Laborers Pre-hearing Comments, pp. 4-5.

The CISC understands that the "competent person" has been an historical part of many OSHA construction standards. However, crystalline silica in the construction environment is unlike any previous OSHA health standards for the construction industry. Given the ubiquitous nature of silica in construction, there is no inherent value in expanding the role of a competent person in any final rule.

The stakeholders suggesting this expanded role also appeared to suggest that a "competent person" be assigned to all job sites: "In the complex world of construction, a competent person is absolutely essential to monitor the evolving work and its silica hazards, assess what protections are necessary and ensure these protections are consistently and fully implemented." Id. at 5. This, of course, ignores the reality of construction and particularly the reality of construction for many small employers. Kellie Vazquez, a small employer with a robust silica exposure control program, explained the reality of how her operations work:

> My guys are one-man crews. So I will have one operator in a truck and that truck is loaded with his equipment to go do his multiple jobs per day. He is his own operator, his own equipment operator, his own supervisor, his own foreman. He has the right to shut down any job he feels that is not safe.

> I don't have a second man, or a competent person, or a supervisor go with him on site to look at the job and verify if it is safe or not. That's his responsibility. That's what he is trained to do. My operators have 30-hour OSHA. They are trained in trenching and excavation. They are competent people in trenching and excavation. They are scaffold builders. They get aerial lift trained. They are their own foreman, their own supervisor.
>
> I believe and Holes, Incorporated, believes that under general duty, every employee has a right to work under a safe environment. Therefore, it's his – he need[s] to be trained to be aware of what a safe environment is. And so that's how we are all trained. My operators are trained. My mechanics are trained. My project managers are trained.

Tr. 3580, 1385 (Kellie Vazquez).

As Ms. Vazquez noted during the hearing, often the extent of a "crew" that Holes Incorporated will utilize consists of one person. There are not necessarily multiple individuals on a crew, with a person assigned as a competent person. In the CISC's view, the key to protection is training all exposed employees in hazard recognition and control and not relying on competent person requirements or written access control plans that do not translate to respirable crystalline silica.

V. Final Economic Analysis.

As with technological feasibility, OSHA must demonstrate that a rule is economically feasible for the industries affected. OSHA included estimates of the cost and economic impacts of the proposed rule in the PEA. The CISC retained Environomics to analyze OSHA's estimates and develop other re-estimates, both for engineering controls (wet methods, LEV, etc.) and for the proposed ancillary requirements. The cost estimates and analysis were submitted into the docket for this rulemaking in the first part of the bifurcated post-hearing comment period. A description of the analysis and the findings is summarized below. (A full report is attached to this brief as Appendix B.). The CISC respectfully asserts that these re-estimates are based upon more accurate information and cost inputs and use of better analytical methodologies that more appropriately reflect the manner in which construction work is performed.

The CISC estimates that compliance with OSHA's proposed standard would cost the construction industry nearly $3.9 billion per year, an amount nearly eight times larger than OSHA's estimate. OSHA has grossly underestimated the costs that construction industries

will incur to comply with the proposal. In estimating costs, OSHA has presumed wrongly that only 19 of the more than 40 construction occupations perform tasks that can generate significant exposures to respirable crystalline silica, missing entirely the large impact of the regulatory requirements on additional construction trades such as plumbers, electricians, roofers, and plasterers. OSHA has similarly overlooked the impact the proposed rule will have on self-employed construction workers. There are many reasons why the 2.5 million self-employed construction workers will be compelled in practice to perform dusty tasks in a manner consistent with the specifications in the proposed rule, and OSHA has incorrectly ignored them in its analysis.

In the Agency's cost analysis, it has also made the entirely impractical assumption that controls (e.g., wet methods, LEV) for the tools that construction workers use in performing tasks that generate respirable silica need to be available only during the exact duration while a dusty task is performed. The CISC estimates costs instead to provide control equipment on an "always available" basis to workers who engage in dusty tasks. Control equipment must be available whenever a worker may need to perform an at-risk task, and not for only the very limited duration when the at-risk task is actually being performed. Costs for the engineering controls required to meet the reduced PEL in the proposed rule will be far higher than OSHA estimates.

OSHA has also ignored the additional costs to the construction industry that will result from the proposed rule for General Industry. Many of the to-be-regulated general industries produce materials (e.g., concrete, brick, block, tile, stone, glass) and products (e.g., plumbing fixtures, roofing shingles, cast iron pieces, porcelain enameled electrical parts, insulation, paint) used in construction. As the rule for General Industry causes costs to rise for the regulated general industries, these industries will pass some of their cost increases on to their construction industry customers in the form of higher prices, and these additional costs will have a further effect on construction industries that must also be evaluated.

The tables below set forth the re-estimated compliance costs, first for the construction industry with respect to the proposed construction standard specifically, and then the larger burden the construction industry will face when considering also the costs that will be passed through when the general industries that supply construction products incur costs to meet the general industry standard.[7]

[7] Environomics has estimated the pass-through costs due to the general industry portion of the standard by: 1) adopting the compliance cost estimate for most of the affected general industry sectors that was developed for the American Chemistry Council Crystalline Silica Panel by URS

Estimated Compliance Costs for the Proposed Silica Standard
Directly for the Construction Industry
(in millions of 2009 dollars annually)

	OSHA Estimate	CISC Estimate
Engineering Controls	242.6	3,334.1
Program Requirements		
Respirators	84.0	108.9
Exposure Assessment	44.6	132.6
Medical Surveillance	76.0	184.6
Training	47.3	102.6
Regulated Areas	16.7	29.1
Program Subtotal	*268.6*	*557.8*
Total	511.2	3,891.9

Distribution of Estimated Direct Compliance Costs by 4-Digit Construction NAICS
(in millions of 2009 dollars annually)

	OSHA Estimate		CISC Estimate		
	Controls	Total	Controls	Program Req'ts	Total
Residential Building Construction	14,610,121	23,288,881	447,068,344	60,785,614	507,853,958
Nonresidential Building Construction	16,597,147	39,664,914	265,117,178	50,164,989	315,282,167
Utility System Construction	30,877,799	46,718,162	265,133,752	19,131,478	284,265,230
Land Subdivision	676,046	1,110,789	11,521,283	928,064	12,449,348
Highway, Street, and Bridge Construction	16,771,688	30,807,862	204,651,559	18,612,774	223,264,333
Other Heavy and Civil Engineering Construction	4,247,372	7,164,210	62,031,379	3,929,725	65,961,104
Foundation, Structure, and Building Exterior Contractors	66,484,670	215,907,211	541,876,073	180,080,806	721,956,879
Building Equipment Contractors	3,165,237	4,902,139	280,080,301	103,433,471	383,513,772
Building Finishing Contractors	34,628,392	50,259,239	421,460,009	69,184,047	490,644,056
Other Specialty Trade Contractors	43,159,424	68,003,978	675,378,465	30,148,936	705,527,401
State and Local Governments	11,361,299	23,338,233	159,788,942	21,398,293	181,187,235
Total	242,579,194	511,165,618	3,334,107,285	557,798,198	3,891,905,483

Corporation; 2) assuming that half (50%) of these estimated compliance costs for general industry will be passed on to their customers in the form of increased prices for their products; 3) using a well-respected input-output model of the U.S. economy (IMPLAN) to estimate the value of the inputs from each affected general industry that is used to generate a dollar's worth of outputs from each construction industry; and 4) combining 1 through 3 to estimate the amount of cost increase that each construction industry will incur as a result of the estimated compliance costs incurred by each general industry.

Total Costs for Construction Industry from Proposed Standard: Direct Costs from Construction Standard Plus Pass-Through Costs from General Industry Standard (in millions of 2009 dollars annually)

NAICS	Construction Industries	Direct Compliance Costs (CISC estimate)	Cost Pass-Through from General Industry*	Total Costs From Entire Proposed Rule
236100	Residential Building Construction	$507,853,958	$77,949,968	$585,803,926
236200	Nonresidential Building Construction	$315,282,167	$234,480,071	$549,762,237
237100	Utility System Construction	$284,265,230	$73,373,572	$357,638,801
237200	Land Subdivision	$12,449,348	$9,545,837	$21,995,185
237300	Highway, Street, and Bridge Construction	$223,264,333	$72,271,351	$295,535,685
237900	Other Heavy and Civil Engineering Construction	$65,961,104	$14,547,871	$80,508,976
238100	Foundation, Structure, and Building Exterior Contractors	$721,956,879	$117,776,248	$839,733,127
238200	Building Equipment Contractors	$383,513,772	$22,331,258	$405,845,030
238300	Building Finishing Contractors	$490,644,056	$75,376,046	$566,020,102
238900	Other Specialty Trade Contractors	$705,527,401	$62,947,030	$768,474,431
999000	State and Local Governments	$181,187,235	N/A	N/A
	Total	$3,891,905,483	$760,599,251	$4,652,504,734

* Estimated based on: 1) Compliance costs for General Industry estimated by URS Corp. for ACC Crystalline Silica Panel, 2) Assumed 50% cost pass-through, 3) Construction industry inputs from each General Industry as given by IMPLAN.

Furthermore, as set forth below, the CISC's re-analysis shows that eight of the ten construction industries (defined in OSHA's aggregated manner that dilutes and reduces the calculated impact of the regulatory costs) will face compliance costs from the proposed rule that exceed OSHA's traditional revenue/profits threshold and the proposed rule should be found to be economically infeasible.

Estimated Total Costs Exceed 10% of Profits for 8 of 10 Construction Industries

NAICS	Construction Industries	Total Costs (CISC) as a % of Revised* Profits	OSHA Costs as a Percentage of Revised* Profits
236100	Residential Building Construction	23.63%	0.94%
236200	Nonresidential Building Construction	7.37%	0.53%
237100	Utility System Construction	10.96%	1.43%
237200	Land Subdivision	-12.28%	-0.62%
237300	Highway, Street, and Bridge Construction	9.19%	0.96%
237900	Other Heavy and Civil Engineering Construction	12.44%	1.11%
238100	Foundation, Structure, and Building Exterior Contractors	15.15%	3.90%
238200	Building Equipment Contractors	38.62%	0.47%
238300	Building Finishing Contractors	15.96%	1.42%
238900	Other Specialty Trade Contractors	25.97%	2.30%
999000	State and Local Governments	N/A	N/A
	Total	15.52%	1.70%

* "Revised" profits extend the averaging period for profits from 2000 - 2006 (OSHA) to 2000 - 2011 (revised) and calculate profitability for an industry across all corporations in that industry, not only those that were profitable in the year in question (as OSHA did)

Table 1, below, summarizes the major issues identified in OSHA's cost analysis. Table 1 also introduces the key differences in methodological approach that OSHA and the CISC employ on each issue. Appendix B explains the CISC's cost re-analysis in more depth, expands on the problematic features of OSHA's approach, and contrasts them with the key features of the CISC approach. It also discusses several additional smaller suggested changes or corrections to OSHA's cost analysis that are not included in the Table.

Table 1
Overview of Major Issues Concerning OSHA's Cost Estimates for the Proposed Rule and Key Differences Between OSHA's and the CISC's Approaches for Cost Estimation

	Issue	**OSHA's Approach**	**CISC Approach**
1.	OSHA wrongly fails to count and include many construction occupations in the cost analysis.	OSHA considers 19 construction occupations comprising 3.24 million workers who routinely engage in the 12 dusty tasks addressed by the Agency in its analysis.	The CISC includes nine additional construction occupations representing a further 1.26 million workers who also routinely engage in dusty tasks identical or similar to those addressed by OSHA in its analysis. The CISC also adds many more of the 0.86 million carpenters and helpers than OSHA includes.
2.	OSHA fails to estimate the impact that the rule will have on how self-employed workers perform construction work.	The proposed rule does not apply to self-employed workers.	There are many reasons why the proposed rule will eventually cause self-employed construction workers to perform construction tasks similarly as the standard will require for workers employed by covered employers, as set forth in Appendix B. The CISC includes costs also for 1.43 million self-employed construction workers in occupations that routinely perform tasks at-risk of silica exposure.

	Issue	OSHA's Approach	CISC Approach
3.	OSHA's cost analysis for engineering controls focuses on at-risk full time equivalents (FTE) instead of workers, resulting in drastically underestimating the need for and costs of control equipment (LEV, wet methods, etc.).	OSHA estimates costs to provide the control equipment prescribed in Table 1 to workers for only the amount of time that they are estimated to spend actually performing at-risk tasks producing respirable silica dust.	The CISC estimates costs instead to provide control equipment on an "always available" basis to workers who engage in dusty tasks. Control equipment must be available whenever a worker may need to perform an at-risk task, and not for only the very limited duration when the at-risk task is actually being performed.
4.	OSHA's "productivity penalties" associated with using the controls mischaracterize and understate actual productivity losses.	OSHA estimates productivity losses involving labor only, reflecting only the additional work time (0 - 5%) needed to perform a task in the manner specified in Table 1.	When a task takes longer to perform while using controls, both more labor and longer availability of control equipment are needed. The CISC estimates productivity losses involving both labor and equipment, and estimates fixed and variable components for each.

	Issue	OSHA's Approach	CISC Approach
5.	OSHA's cost estimates for engineering controls do not reflect construction employers' inability to forecast accurately which at-risk workers will be over-exposed relative to a new PEL and when.	OSHA uses its task-level exposure profiles to estimate the percentage of times when an at-risk task is performed that results in an exposure exceeding the proposed PEL. OSHA then assumes a need for controls and estimates costs only for the percentage of task performances when exposure would have been above the proposed PEL.	In view of the numerous factors that can cause wide and unpredictable variation in the level of exposure when a dusty task is performed, the CISC thinks it more realistic to assume that a prudent employer will provide controls in all instances when a task is performed that could lead to exposure exceeding the PEL. Furthermore, this costing approach is consistent with Table 1, which requires the listed dusty tasks always to be performed in the manner specified if the employer is to avoid monitoring.
6.	OSHA attempts to estimate costs and assess economic feasibility for only the incremental requirements that the proposed rule adds to existing requirements.	Reasoning that current rules already require exposure reduction for any workers now exposed at more than the current PEL (approximately 250 ug/m^3), OSHA estimates the incremental cost of the proposed standard as the cost to reduce exposures to below the proposed PEL for those employees now exposed at between 50 and 250 ug/m^3.	The CISC estimates for the economic feasibility assessment the "full" costs to reduce all current worker exposures to below the proposed PEL, not only the "incremental" costs beyond what the current standard requires. And, OSHA errs in estimating the "incremental" costs, since current regulations require employers to reduce exposures for those exposed above 250 ug/m^3 only to below that figure, not all the way to below 50 ug/m^3 as OSHA's approach seems to imply.

	Issue	OSHA's Approach	CISC Approach
7.	OSHA underestimates the costs of the ancillary provisions.	OSHA uses its estimate of 1.8 million workers as the starting point for its estimates of workers who would be covered under each of the proposed ancillary program requirements.	The CISC disagrees with some of OSHA's assumptions and estimates in projecting costs for the ancillary requirements. The CISC also uses a higher starting point, including both workers in OSHA's at-risk occupations and those in the additional at-risk occupations we identify. (But the CISC does not assume that self-employed construction workers will be induced to meet the ancillary requirements.).

VI. Conclusion.

OSHA's proposed crystalline silica rule, if finalized, will have a profound impact on construction operations and the construction industry as a whole. OSHA has been developing its approach to crystalline silica for over a decade. It has now received comments from the public on its overall approach and underlying analyses.

The CISC shares OSHA's desire to ensure that all employees are protected from respirable crystalline silica. Regardless of the outcome of this rulemaking, CISC-participating trade associations will work diligently with member companies to help ensure this occurs.

The CISC appreciates that OSHA views a regulatory approach to the issue of respirable crystalline silica as necessary. The CISC disagrees with this, particularly given the historic decline in silicosis cases as tracked by the CDC. Moreover, the CISC disagrees with OSHA's approach in this proposed rule. The CISC believes that OSHA needs to re-think the way it regulates health standards in the construction industry in order to devise a workable rule for crystalline silica. Relying on approaches used in previous health standards will not work here, given how ubiquitous silica is on construction worksites. While the CISC understands that OSHA has spent significant time and resources on this rulemaking, it also believes that the Agency has failed to meet its burden to show the proposal is

technologically and economically feasible in the construction industry. As a result, the CISC continues to request that OSHA withdraw the proposed rule.

As the participating trade associations in the CISC have stated repeatedly, the CISC would welcome the opportunity to engage in a working dialogue with OSHA on what type of approach to crystalline silica would actually work in construction. We also encourage OSHA to work with the construction industry to ensure that the positive reduction in silicosis-related disease continues.

The CISC appreciates OSHA's consideration of its comments and testimony throughout the rulemaking process, and hopes that the Agency thoroughly reviews the entire rulemaking record before determining what is the appropriate approach to take with respect to crystalline silica in construction.

Appendix A

Associated Builders and Contractors, Inc. (ABC) is a national construction industry trade association with 22,000 chapter members. ABC and its 70 chapters help members develop people, win work and deliver that work safely, ethically and profitably for the betterment of the communities in which they work. ABC member contractors employ workers, whose training and experience span all of the 20-plus skilled trades that comprise the construction industry. Moreover, the vast majority of our contractor members are classified as small businesses. Our diverse membership is bound by a shared commitment to the merit shop philosophy in the construction industry. The philosophy is based on the principles of nondiscrimination due to labor affiliation and the awarding of construction contracts through open, competitive bidding based on safety, quality and value. This process assures that taxpayers and consumers will receive the most for their construction dollar.

AGC of America

THE ASSOCIATED GENERAL CONTRACTORS OF AMERICA

Quality People. Quality Projects.

The Associated General Contractors of America (AGC) is the leading association for the construction industry, and places safety in the construction industry as a priority. Founded in 1918 at the express request of President Woodrow Wilson, AGC is a full service trade association representing nearly 30,000 firms in partnership with a network of 94 exceptional chapters throughout the United States. Among the association's members are approximately 7,500 of the nation's leading general contractors, more than 12,500 specialty contractors, and more than 13,000 material suppliers and service providers to the construction industry. AGC members play a powerful role in sustaining economic growth, in addition to producing structures that add to productivity and the nation's quality of life.

AGC member firms engage in the construction of buildings, shopping centers, factories, industrial facilities, warehouses, highways, bridges, tunnels, airports, waterworks facilities, waste treatment facilities, dams, hospitals, water conservation projects, defense facilities, multi-family housing projects, municipal utilities and other improvements to real property. And unlike many associations in the industry, we proudly represent both union and open-shop construction contractors. AGC is truly the "voice and choice" of the construction industry.

American Subcontractors Association, Inc.

The American Subcontractors Association, Inc. (ASA) is a national trade association representing subcontractors, specialty trade contractors, and suppliers in the construction industry. ASA's 5,000 members work in virtually all of the construction trades and on virtually every type of horizontal and vertical construction. ASA members frequently contract directly a construction owner. More often, they serve as subcontractors dealing with the ultimate construction owner through a prime contractor. More than 60 percent of ASA members are small businesses.

ASA Vision: The American Subcontractors Association is recognized as the united voice dedicated to improving the business environment in the construction industry.

ASA Mission: The American Subcontractors Association amplifies the voice of and leads trade contractors to improve the business environment for the construction industry and to serve as a steward for the community.

ASA Values: The ideals and beliefs of ASA are ethical and equitable business practices, quality construction, a safe and healthy work environment, integrity and membership diversity.

The Only Association By And For All Concrete Contractors

The American Society of Concrete Contractors was formed by and for concrete contractors and others who provide services and goods to the concrete construction industry. It is a powerful organization of contractors who share the same goals – to improve their businesses and their roles as contractors. Members include contracting firms, manufacturers, suppliers, designers and other professionals. There are approximately 500 member companies in the U.S. and abroad in the American Society of Concrete Contractors.

ASCC seeks to be the voice of the concrete contractor, serving as a collective instrument to give members of the concrete construction industry a stronger presence in the construction industry as a whole.

ASCC is committed to helping members enhance the quality of their construction and their businesses. Members of this concrete contractor association become better equipped to improve all aspects of their performance with the help of valuable information and member interaction.

Association of the Wall and Ceiling Industry

AWCI is a trade association providing members with industry information, contacts and leadership for the wall and ceiling industries. Member companies are among the most successful in the industry. They are union and non-union wall and ceiling contractors of all sizes, manufacturers, suppliers and distributors throughout the world.

AWCI represents 2,200 companies and organizations in the acoustics systems, ceiling systems, drywall systems, exterior insulation and finishing systems, fireproofing, flooring systems, insulation, and stucco contractors, suppliers and manufacturers and those in allied trades. Our mission is to provide services and undertake activities that enhance the members' ability to operate a successful business.

AWCI is highly regarded by members of our industry as providing valuable technical and product information, education and training, industry contacts and the collaborations essential to operating a successful business, and is the principal organization advocating the interests of contractors, suppliers and manufacturers in the wall and ceiling industries.

AWCI is a national leader in trade-specific education programs covering the wall and ceiling industry. AWCI continues to expand its list of programs to cover every facet for the wall and ceiling contractor. All AWCI Doing It Right programs (except EIFS—Doing It Right®) are designed specifically for owners, project managers, estimators, superintendents, foremen, architects and code officials. EIFS—Doing It Right® is a certificate program targeting EIFS mechanics, inspectors and industry professionals. All AWCI Doing It Right program content is based on industry accepted standards and best practices.

AWCI is the prime source of information published for the wall and ceiling industries. AWCI members receive technical and news periodicals throughout the year. Experienced staff will assist members with the latest technical documentation and keep them informed of changes in codes, specifications and standards. The largest technical information and resource library for the wall and ceiling industry, which is owned by the Foundation of the Wall and Ceiling Industry, is located at AWCI headquarters.

Established in 1902, the Washington, D.C.-based American Road & Transportation Builders Association (ARTBA) is the "consensus voice" of the U.S. transportation design and construction industry before Congress, federal agencies, the White House, news media and general public. The association's mission is simple: We are a federation whose primary goal is to aggressively grow and protect transportation infrastructure investment to meet the public and business demand for safe and efficient travel. From the beginning, ARTBA has been a major leadership force in the development of federal transportation policy. The association's 5,000+ private and public sector members are involved in the planning, designing, construction and maintenance of the nation's roadways, bridges, ports, airports and transit systems. Our industry generates more than $380 billion annually in U.S. economic activity and sustains more than 3.3 million American jobs.

Since 1919, the Building Stone Institute (BSI) has worked on behalf of the quarries, fabricators, retailers, importers, exporters, carvers, sculptors, restorers, designers, and installers that comprise our diverse membership. BSI provides programs and services that empower our member companies to offer the highest level of quality products and services. BSI resources are necessary tools that enable our members to educate the architectural and design communities on the benefits and uses of natural stone. BSI is a not-for-profit trade association dedicated to serving its member firms, and providing educational materials and continuing education on the uses and benefits of natural stone. We support efforts to continually increase the quality of service, quality of products, and demand for stone. Our website is informative about the organization, abundant in stone awareness and technical guidance plus a convenient resource to locate experts for all aspects of natural stone.

BSI is a proud continuing education provider with the American Institute of Architects & the American Society of Landscape Architects, a founding member of the Natural Stone Council and a member of the U.S. Green Building Council.

The Concrete Sawing & Drilling Association (CSDA) is a nonprofit trade association of contractors, manufacturers and affiliated members from the construction and renovation industry. The CSDA mission is to promote the selection of professional industry contractors and their methods. Diamond tools for projects requiring sawing, drilling, selective demolition, cutting and polishing offers the construction industry many benefits including lower total project costs, precision cutting, maintenance of structural integrity, reduced downtime, reduced noise, dust and debris, limited access cutting and the ability to cut heavily-reinforced concrete. CSDA offers its members access to multiple training programs and safety documents, as well as educational opportunities at its annual convention and online. Founded in 1972, CSDA has 500 member companies worldwide.

The Construction & Demolition Recycling Association promotes the recycling of materials generated from construction and demolition (C&D) projects. These materials can be generated from road, bridge, or building projects. While no official government estimates exist for the total material stream, conservative estimates put the amount of C&D material generated annually in the United States at 350 million tons, with some experts saying as much as 650 million tons is generated. For point of comparison, EPA estimates municipal solid waste generation to be around 240 million tons annually.

Components of the material stream include concrete, asphalt, wood, asphalt shingles, plastics, metals, carpet, and drywall, among other items. By weight, probably the most recycled material in the United States is concrete, at about 140 million tons. Asphalt is close behind. In addition, asphalt shingle generation is about 11 million tons annually, with the amount recycled at about 2 million tons.

The CDRA has 275 members throughout North America. Almost all these companies are privately held small businesses. Obviously the benefits of recycling all these companies bring to the environment is tremendous. For example, that 140 million tons of concrete recycled would otherwise go to landfills, quickly filling them up, while also requiring an equal amount of mining activity to take place. In addition, the industry provides thousands of green jobs to the economy.

DCA represents contractors, suppliers and manufacturers who provide construction services including installation, replacement and rehabilitation of natural gas pipelines, water and wastewater infrastructure, as well as fiber optic, cable and duct systems in communities across the country.

ICE is the only wholly union international masonry contractors' association, representing approximately 10,000 signatory contractors who perform, brick, block, stone, tile, marble, terrazzo, cement masonry, plastering and restoration work. Its members employ the highest skilled, safest and best trained workers in the masonry industry. The primary purpose of ICE and its affiliate entities is to engage in labor relations matters with the International Union of Bricklayers and Allied Craftworkers (BAC) and its constituent local unions. The contractor members and officers of ICE are committed to working in harmony with the BAC to further the collective bargaining process, to enhance work opportunities for members of the union and to increase business opportunities for union contractors. ICE works with the BAC to provide union masonry craftworkers with the best training available, safe jobsites, pensions and healthcare. It works with its affiliates and other signatory contractors' associations to provide signatory masonry contractors with labor relations, education, staffing services and political advocacy specifically needed by the signatory contractor.

Pavers in Every Project!

As the leading technical organization on segmental concrete pavement systems, the Interlocking Concrete Pavement Institute (ICPI) provides substantial resources to concrete paver producers, contractors, suppliers, design professionals and distributors. Members representing this growing industry support the association's mission while utilizing its wealth of resources to gain a competitive business edge.

Our Mission:
To increase awareness, acceptance and use of segmental concrete pavement systems in North America.

What We Do:

- **Education:** ICPI and its members hold education and certification programs across the US and Canada, providing top quality education for contractors, sales and design professionals, university professors and municipal officials.
- **Communications and Marketing:** ICPI provides continuous communication and marketing efforts to members, users and specifiers regarding the benefits of segmental concrete pavement systems. This is done through various mediums including www.icpi.org, *Interlock Design* magazine, publications and e-newsletters aimed at specific audiences.
- **Government Affairs and Advocacy:** Advocating for our members and promoting the value of our industry is a top priority. ICPI identifies opportunities to educate policymakers and addresses legislative and regulatory issues affecting the segmental concrete pavement industry.
- **Industry Standards and Research and Development:** ICPI staff participates on ASTM and CSA committees governing paving product standards and liaisons with various other associations, to represent industry best interests. ICPI's participation with ASTM and CSA has led to improvements in existing paver standards and test methods.
- **ICPI Foundation:** The ICPI Foundation for Education and Research supports, develops and conducts educational programs, seminars, courses and research, and disseminates information relating to interlocking concrete pavement.

Our Members:
ICPI began in 1993 with 66 charter members, since then membership has grown to over 900 companies. The diverse and unique membership represents manufacturers, contractors, industry suppliers and distributors. Our members are made up of strong, passionate leaders committed to the future growth and success of our industry.

Leading Builders of America (LBA) is a Washington, DC based trade association representing twenty one of the nation's largest homebuilding companies. Our members construct about one third of the new homes sold annually in the United States, generating over $33 billion in revenue and accounting for over 350,000 jobs through direct employment and the engagement of subcontractors. LBA's primary goal is ensuring that new homes remain affordable for American families.

Celebrating 70 Years • 1944–2014

Setting the Standards for Natural Stone

About the Marble Institute of America

Headquartered in Cleveland, Ohio, the Marble Institute of America (MIA) has served as the authoritative source of information on standards of natural stone workmanship and practice and the application of natural stone products for 70 years.

Membership in the association is worldwide and includes over 1,600 natural stone producers, exporters/importers, distributors/wholesalers, fabricators, finishers, installers, and industry suppliers committed to the highest standards of workmanship and ethics.

MIA offers an industry accreditation program for fabricators and installers, markets a range of technical publications and consumer pamphlets on natural stone, sponsors business and technical meetings and seminars on industry-related topics, provides educational programming for architects and construction specification professionals, and conducts the annual Pinnacle Awards competitions recognizing outstanding natural stone projects worldwide.

MIA is also a leading promoter of stone usage in the commercial and residential marketplaces, producing consumer education materials on the use of natural stone and its proper care and maintenance. More information can be found on the association's website: http://www.marble-institute.com.

MIA Position Statement:

The Marble Institute of America (MIA) is urging OSHA to maintain the current silica exposure levels as they are appropriate if adhered to. Data from the U.S. Centers for Disease Control (CDC) show a greater than 90 percent reduction in the silicosis mortality rate from 1968 to 2010. It is doubtful that a further reduction of the allowable exposure limits will impact those numbers.

Advances in wet cutting and stone industry education have positively aided OSHA in the effort to curb silica exposure during the past few years. The MIA believes that OSHA will continue to have a positive impact if attention is focused on compliance at the current exposure levels.

The natural stone industry advocates the use of proper equipment, training, vigilance and continual monitoring to minimize the risk of silicosis. The MIA has produced videos, handouts, and training guidelines on awareness and prevention of silicosis, and is providing many of those resources free-of-charge to stone companies online.

Again, the MIA is 100% committed to workplace safety. The well-being of our member companies, and the stone industry as a whole, is at the core of what we do every day. This new rule will require our members, and all companies in the stone industry, to endure additional burdens, despite the fact that consensus on the safety impact has yet to be reached. Learn more at www.marble-institute.com/silica.

The Mason Contractors Association of America (MCAA) is the national trade association representing all mason contractors both union and open shop. MCAA was incorporated in 1950. Its purpose is to help educate, train, and represent the mason contractor through its various programs aiding members to maintain their competitive edge against other construction methods.

In addition, the MCAA promotes the use of masonry, actively recruits and assists in training of the industries workforce, advocates for federal legislative issues and standards affecting contractors and provide educational programs for the employees of member firms. One such program includes weekly webinars throughout the year through the MCAA webinar series. The MCAA contracts with a lobbying firm in DC to advocate for our positions consistent with our purpose. The MCAA is a 501 C 6 not for profit entity.

In 2008 the MCAA created a new entity called the Masonry Foundation which is controlled by a spate Board, has separate by-laws and operates as an independent foundation. The foundation's purpose is to support education, training and research priorities of the industry. The Masonry Foundation is a 501 C 3 organization and is currently in the process of a five year endowment building campaign.

The MCAA has been operating for nearly 65 years and is proud of it's rich history in advocating for all mason contractors throughout the US.

The Association

The Mechanical Contractors Association of America (MCAA) is a non-profit construction trade association representing more than 2,400 members nationwide and overseas. More than 2,000 of MCAA's members are mechanical construction and/or service firms.

- Most MCAA contractor members perform both mechanical construction and mechanical service work;
- All of MCAA's contractor members are union contractors;
- Their companies employ more than 270,000 union workers; and
- The association has 85 local affiliates (chapters) throughout the United States and overseas.

Mechanical Construction

Mechanical construction firms are primarily involved in the installation of:

- Piping systems:
- Plumbing systems:
- Heating systems;
- Ventilation systems;
- Air Conditioning systems;
- Fire Sprinkler systems; and
- Refrigeration systems.

Mechanical Service

Mechanical service firms are primarily involved in the maintenance and repair of:

- Heating Systems;
- Ventilation Systems;
- Air Conditioning Systems; and
- Refrigeration Systems.

Founded in 1942, the National Association of Home Builders (NAHB) is a Washington, D.C.-based trade association representing more than 140,000 members involved in home building, remodeling, multifamily construction, property management, specialty trade contractor, design, housing finance, building products manufacturing, and all other aspects of the residential and light commercial construction industries. NAHB is affiliated with more than 800 state and local home builders associations (HBAs) located in all 50 states and Puerto Rico. NAHB's members touch on all aspects of the residential construction industry. About one-third of NAHB's members are home builders and/or remodelers. The others are associates working in closely related specialties such as sales and marketing, housing finance, and manufacturing and supplying building materials. Currently, the residential construction sector employs over 2 million people and NAHB's builder members will construct approximately 80 percent of the new housing units projected in the next 12 months, making housing one of the largest engines of economic growth in the country. The more than 14,000 members that belong to NAHB Remodelers Council comprise about one fifth of all firms that specify remodeling as a primary or secondary business activity. The NAHB Multifamily Council is comprised of more than 1,000 builders, developers, owners, and property managers of all sizes and types of multifamily housing comprising condominiums and rental apartments.

For over two decades, NAHB and its members have been at the forefront of enhancing safety and health in residential construction. NAHB has taken part in numerous Occupational Safety and Health Administration (OSHA) rulemakings and our members have experience in complying with the myriad of OSHA regulations that affect the residential construction industry. NAHB has been an active partner with OSHA through its Alliance Program and participation on OSHA's Advisory Committee on Construction Safety and Health (ACCSH). Together, NAHB and OSHA have worked to improve worker safety and prevent workplace fatalities, injuries, and illnesses in the home building industry. Because of this experience and expertise, NAHB is well positioned to provide useful information, advice, and input to federal regulators, such as OSHA.

NARI®
NATIONAL ASSOCIATION OF
THE REMODELING INDUSTRY

NARI is a non-profit trade association with national headquarters based in Des Plaines, IL with 57 local chapters located in most major metro areas. NARI members are engaged in repair/remodel of residential and commercial construction. NARI members voluntarily subscribe to a strict Code of Ethics and Standards of Practice.

NARI is the only national organization dedicated exclusively to the remodeling industry. NARI members are entrusted to work on the most valued asset of their clients and customers—their home.

NARI delivers rigorous education and certification programs including Certified Remodeler, Certified Lead Carpenter, Certified Kitchen and Bath Remodeler, Green Certified Professional and Universal Design Certified Professional and Certified Remodeler Project Manager. These programs are a NARI hallmark.

NARI annually awards Contractor of the Year (CotY) awards which recognize remodeling project excellence and expertise.

NARI'S CORE PURPOSE
To advance and promote the remodeling industry's professionalism, product and vital public purpose

NARI'S CORE VALUES
Professional: Ethical and honest; committed to high standards
Open: Diverse and respectful; inclusive of many views and dedicated to free expression
Progressive: Informed and knowledgeable; resourceful and flexible
Member Focused: Focused on importance of success, return on investment and profit

Legacy: Founded 1983
Strength: 6,500+ member companies
Nationwide Network: 27,730 contractors (includes specialized trade contractors). 340,195 employees of allied companies within the industry (vendors, manufacturers, lumberyards, etc.)
Educated: 1,454 hold at least one NARI certification

Our members:
Small: 79.93% employ between 1-10 people. 46% have between $1-$5 M in revenue.
Experienced: 34% of companies have been in business 6-15 years; another 34% have been in business 16-30 years.

The National Demolition Association, founded in 1973, is the trade organization for the Demolition Industry in the United States, Canada and beyond. With over 800 members the organization represents the bulk of the entrepreneurial contractors and suppliers involved with the demolition process. In addition to structural dismantlement the industry is involved with implosions, asbestos, lead, and PCB abatement, the safe handling of hazardous and toxic materials, historic preservation, land clearing, facilities decontamination, specialized rigging, landfilling, C&D recycling, industrial recovery, scrap processing, trucking and general contracting. The Demolition Industry around the world is the largest source of feedstock for the scrap recycling industry and often recycles over 90% of the demolition debris in its material stream. The Association is the repository of safe work practice for the Demolition Industry on a global basis. Its Demolition Safety Manual, which was developed under an OSHA “New Directions” grant, is the bible of safe work practice for the industry around the world. The Association, as part of an OSHA Alliance, developed a Disaster Site Worker Training & Certification Program to train demolition workers as Second Responders at any man-made or natural disaster.

NECA began in 1901 when a group of electrical contractors met in Buffalo, NY to form an association that could help in the fostering of trade among electrical contractors and reform abuses in the electrical industry. Part of its mission was to settle differences between its members and promote more enlarged and friendly discourse among its members.

Today over 3500 NECA members from around the country count on NECA to deliver the resources that help them make better business decisions, provide excellent customer service, and take advantage of innovative technology. NECA's national office and local chapters advance the electrical construction industry through advocacy, education, research, and standards development.

NECA works with members, contractors, building owners, developers, manufacturers, business development staff and NECA chapters to produce training programs, tools, publications and promotional material that position NECA contractors as a customer's full service energy solutions provider.

Our member's voices matters when it comes to the issues, regulations and legislation that affect their businesses. NECA represents members on Capitol Hill with regulatory agencies and federal officials. By monitoring OSHA and DOL rulemaking activities, NECA helps members prepare for and follow the regulations promulgated by those agencies.

By participating with NFPA in the NFPA 70 National Electrical Code making process, NECA can help to ensure better electrical installations for the public. Working with NFPA in the revisions to NFPA 70E, Standards for Electrical Safety in the Workplace, NECA helps its member provide a safe workplace for their employees.

NECA also develops installation standards that are recognized by architects, designers and engineers as the baseline for quality assurance and acceptance. NECA also recognizes emerging technologies such as solar, wind and electric motor vehicles and helps to develop standards with ANSI to ensure these are installed and used in the safest manner possible.

NECA connects our members with the products and services that support their businesses. Electrical contractors count on NECA to deliver the industry's most up-to-date technical guides and e-tools. From PPE Selector to the Manual of Labor Units, NECA can help its members improve productivity, safety and accuracy.

Established in 1886, NRCA is one of the nation's oldest trade associations and the voice of professional roofing contractors worldwide. NRCA is an association of roofing, roof deck, and waterproofing contractors; industry-related associate members, including manufacturers, distributors, architects, consultants, engineers, and city, state, and government agencies; and international members. NRCA has approximately 3,600 members located in all 50 states and 51 countries and is affiliated with 100 local, state, regional and international associations. NRCA contractors typically are small, privately held companies, with the average member employing 30-40 people in peak season and having sales of $3.5 million per year. NRCA members install the majority of new construction roof systems and replacement roof systems on commercial and residential structures in the U.S.

One of NRCA's core objectives is to promote worker health and safety in the roofing industry. NRCA has developed more than 50 roofing safety-related publications, programs and training materials on diverse topics including asbestos abatement, hazard communication, fall protection and crane and hoist operation. In addition, over the past 12 years, OSHA has awarded NRCA 11 individual grants to develop programs designed to improve workplace safety in the roofing industry. Many of those grants have dealt with a priority issue for both OSHA and NRCA: protecting roofing workers from falls. NRCA has been a sitting member of and represents the roofing industry in proceedings before OSHA's Advisory Committee for Construction Safety and Health, is a member of the American National Standards Institute's A10 Committee on Construction and Demolition Operations and the SIO 45001 standard's Technical Advisory Group for Occupational Health and Safety Management Systems.

NUCA

REPRESENTING UTILITY & EXCAVATION CONTRACTORS

NUCA is the largest and most influential national trade association working solely for the excavation and utility construction markets. NUCA represents contractors, manufacturers, suppliers, and other service providers engaged in the water, sewer, gas distribution, electric, communications, construction site development and excavation industries. Founded in 1964, NUCA is entering its 50th year of leadership providing high quality safety services, craft training, management education, and advocacy.

Under the direction of our Safety Department, NUCA offers premier confined space and excavation safety training programs, taught by over 100 instructors nationwide. We also offer a bimonthly safety newsletter, publish a monthly safety article in Utility Contractor magazine, conduct an annual 3-day Safety Directors forum, and provide individualized technical assistance from a CSP on a full range of safety issues, including how to establish and implement a successful safety program and remain in compliance with OSHA regulations. We work closely with the Common Ground Alliance for damage prevention best practices. We provide safety training products, recognize exception safety results through our William H. Feather Safety Awards program, and also invite our members to join the Safety Ambassdors Club, which provides funding for a wide variety of new safety activities, resources and initiatives.

Our Vice President of Safety, George Kennedy (CSP), brings 35 years of professional safety experience to work every day and was awarded the National Safety Council's Distinguished Service to Safety Award (DSSA), it highest individual honor, in 2013.

In 2003, the Natural Stone Council (NSC), a not-for-profit organization, was formed to unite a diverse industry of natural stone producers, fabricators and related affiliates to actively promote the attributes of natural stone in commercial, residential, government, institutional, educational and all types of applications interior and exterior, and to proactively position natural stone as the premier construction material. The NSC is comprised of twelve affiliates representing every type of dimensional stone quarried and fabricated in the United States. The NSC affiliates have a combined membership over 2,200 whose companies' employee in excess of 40,000 workers. The dimension stone industry is a major part of the nation's economy. According to recent Department of Labor figures, 4,380 stone quarries themselves directly employed 35,248 workers, and 2,125 fabrication facilities directly employed 23,666 workers. Additional indirect employment is estimated to be greater than 100,000 people with a total estimated payroll for the industry approaching $4 billion annually.

The affiliates include Allied Stone Industries, Building Stone Institute, Elberton Granite Association, Indiana Limestone Institute, Marble Institute of America, Mason Contractors Association of America, National Building Granite Quarries Association, National Slate Association, Natural Stone Alliance, New York State Bluestone Association, Northwest Granite Manufacturers Association, and Pennsylvania Bluestone Association.

By pooling resources and launching a united branding campaign including the use of a Genuine Stone® coin logo, NSC has successfully established awareness for natural stone's authenticity. Natural stone producers and retailers now have a trusted symbol by which designers and consumers can recognize natural stone and differentiate it from imitation stone products.

To further promote the sustainability of natural stone, the NSC has funded the development of an environmental ANSI based standard, NSC 373, to which stone producers and products can become certified.

The NSC Environmental Compliance Sub-Committee which also includes MSHA-OSHA focused interests is an interdisciplinary group of professionals with expertise in air, land, water and waste resources, management, and regulatory obligations. The committee is made up of professional engineers, professional geologist, and operations leaders to provide a wide understanding of the impacts of environmental compliance on operations. The mission of the sub-committee is to keep members of the Natural Stone Council up to date on the environmental trends and upcoming regulations that may have an impact on the industry and to support related NSC initiatives.

The Natural Stone Council is committed to supporting sustainable initiatives and innovations at all levels of the production of Genuine Stone products. As such, best practices of the industry have been identified and these guidance documents created to provide assistance in implementing environmentally-preferable operations.

Located across the Potomac River from Washington, D.C.'s corridors of power, The Association of Union Constructors (TAUC) – “The Voice for Union Construction” -- occupies a unique space in the nation's capital as the premier national trade association for the union construction industry.

TAUC is made up of more than 2,000 contractor companies that utilize union labor for their projects, as well as local contractor associations and vendors in the industrial maintenance and construction fields.

TAUC's mission is to act as an advocate for union contractors and enhance cooperation between the three entities involved in the successful completion of construction projects: the union, the contractor and the owner-client, the company for which the work is being completed. By encouraging this "tripartite dialogue," many potential issues and delays are eliminated before work even begins.

We strive to demonstrate that union construction is the best option because it is safer and more productive, and also provides a higher-quality and cost-competitive product. We aim to enhance labor-management cooperation, workplace safety and health and collaboration among construction users with the greater goal of making union contractors more competitive in the marketplace.

Founded in 1969 under the auspices of the National Erectors Association, the organization originally served as the voice for union steel erector companies. Over the years, however, the need became apparent for a single national organization to represent all industrial maintenance and construction companies that realize the value of the union workforce, and soon other non-steel erection contractors would join up as well. In recognition of this newfound diversity, in 2007 the association changed its name to The Association of Union Constructors.

TILE ROOFING INSTITUTE

Founded in 1971 (Incorporated in the state of California, non-profit 501C6), the Tile Roofing Institute (TRI) - originally named the National Tile Roofing Manufacturers Association (NTRMA) - has been the leading voice for the concrete and clay tile Industry. The TRI has over 95% of the capacity for roofing tiles within its ranks and has several hundred roofing contractors, distributors and suppliers of related materials. The primary focus of the TRI has been in the development of technical manuals, industry positions and research studies for code language and preferred installation practices within all the major code bodies nationwide. TRI has played a major role in establishing tile performance and recommendations for severe weather, fire and seismic conditions, as well as developing legislation of building codes.

A few instances where TRI's presence has proven to be invaluable include:

- TRI developed the first industry-based series installation guides for all climatic regions in North America.
- TRI assisted the Committee for Firesafe Dwellings in the creation of legislation to ban combustible roofing materials in California.
- TRI guided the tile roofing industry's successful efforts to revise code for high- wind applications and worked with local building officials to upgrade installation standards following Hurricanes that have hit within the USA.
- TRI along with the University of Southern California (USC) determined that tile roofs--when installed under current building codes--withstand forces two-to-three times those generated by the Northridge Earthquake.
- TRI worked with the American Society of Testing Materials (ASTM) to develop standardized testing methods for roof tile.

In addition to the technical aspects of roofing tiles, the TRI provides certified training programs for installation, Specialty and high wind certification. These programs target roofing installers, inspectors and industry professionals on proper, code approved methods to installing concrete and clay tile roofs. TRI is dedicated to growing the tile roofing market through technical expertise, training, and building awareness for the many benefits of tile.

The TRI is an active liaison for roofing tile initiatives with all of the regional roofing contractor associates allowing industry to collaborate with the roofing professionals in developing recommended and best practices that address product, installation and safety concerns.

Appendix B

Report to the Construction Industry Safety Coalition

Costs and Economic Feasibility of OSHA's Proposed Standard for Occupational Exposure to Respirable Crystalline Silica in the Construction Industry

Environomics, Inc.

August 18, 2014

I. Summary.

This report summarizes our findings in reviewing and assessing OSHA's economic analysis in support of the Proposed Standard for the construction industry and in developing our own assessment of the costs and economic feasibility of OSHA's proposal. This report is provided to the Construction Industry Safety Coalition (CISC), which has funded our work.

Our primary task has been to develop a more accurate estimate of the likely costs of the Proposed Standard for the construction industry than OSHA has developed. We have reviewed and critiqued OSHA's cost estimates and developed our own re-estimates, both for engineering controls (wet methods, LEV, etc.) and for the proposed ancillary requirements. We have developed our re-estimates based upon more accurate information and cost inputs and use of better analytical methodologies that more appropriately reflect the manner in which construction work is performed.

We estimate that compliance with OSHA's proposed standard would cost the construction industry nearly $3.9 billion per year, an amount nearly eight times larger than OSHA's estimate.

Table 1: Estimated Compliance Costs for the Proposed Silica Standard for the Construction Industry (in millions of 2009 dollars annually)

	OSHA Estimate	Our Estimate
Engineering Controls	242.6	3,334.1
Program Requirements		
Respirators	84.0	108.9
Exposure Assessment	44.6	132.6
Medical Surveillance	76.0	184.6
Training	47.3	102.6
Regulated Areas	16.7	29.1
Program Subtotal	*268.6*	*557.8*
Total	511.2	3,891.9

Table 2: Distribution of Estimated Compliance Costs by 4-Digit NAICS (in millions of 2009 dollars annually)

	OSHA Estimate		Our Estimate		
	Controls	Total	Controls	Program Req'ts	Total
Residential Building Construction	14,610,121	23,288,881	447,068,344	60,785,614	507,853,958
Nonresidential Building Construction	16,597,147	39,664,914	265,117,178	50,164,989	315,282,167
Utility System Construction	30,877,799	46,718,162	265,133,752	19,131,478	284,265,230
Land Subdivision	676,046	1,110,789	11,521,283	928,064	12,449,348
Highway, Street, and Bridge Construction	16,771,688	30,807,862	204,651,559	18,612,774	223,264,333
Other Heavy and Civil Engineering Construction	4,247,372	7,164,210	62,031,379	3,929,725	65,961,104
Foundation, Structure, and Building Exterior Contractors	66,484,670	215,907,211	541,876,073	180,080,806	721,956,879
Building Equipment Contractors	3,165,237	4,902,139	280,080,301	103,433,471	383,513,772
Building Finishing Contractors	34,628,392	50,259,239	421,460,009	69,184,047	490,644,056
Other Specialty Trade Contractors	43,159,424	68,003,978	675,378,465	30,148,936	705,527,401
State and Local Governments	11,361,299	23,338,233	159,788,942	21,398,293	181,187,235
Total	242,579,194	511,165,618	3,334,107,285	557,798,198	3,891,905,483

We have developed this cost estimate in a large and detailed spreadsheet model in Microsoft Excel. The model replicates the steps in OSHA's cost analysis for the proposed regulation, but modifies OSHA's methodology at many points, uses better data, and corrects some errors in OSHA's approach. We have provided the model previously to OSHA as a part of the CISC's "post-hearing comments", and the CISC will soon also provide this report as a portion of the CISC's "post-hearing brief" for the rulemaking record. We hope to be able to discuss with the Agency the respects in which the model improves on OSHA's analysis. The Excel workbook showing the details of the model's data, assumptions, methodology and calculations provides more thorough documentation of our cost analysis than we can include in this summary report.

Our second area of work has been to analyze the economic impacts on construction industries if they were to face the compliance costs that we estimate. OSHA's initial test for judging economic feasibility is to ask whether the projected compliance costs for a proposed occupational exposure standard exceeds either 1% of an affected industry's revenues or 10% of the industry's profits. If costs are less than these thresholds the proposed regulation is presumed to be economically feasible. If costs exceed either of these thresholds there is some indication of possible economic infeasibility, and OSHA will perform further, more detailed analysis.

In OSHA's economic impact screening analysis presented in the Agency's Preliminary Economic Analysis (PEA), the Agency finds that the Proposed Standard will impose costs that are less than the 1% and 10% thresholds for every affected construction industry, and that the regulation is therefore economically feasible for all construction industries. We believe this analysis is substantially flawed. In our view, OSHA has made significant errors at each step in comparing costs against revenues and profits for these industries -- in estimating compliance costs, and in estimating the typical levels of construction industry revenues and profits against which costs are compared.

OSHA has grossly underestimated the costs that construction industries will incur to comply with the Proposed Standard. In estimating costs, OSHA has presumed wrongly that only 19 of the more than 40 construction occupations perform tasks that can generate significant exposures to respirable crystalline silica, missing entirely the large impact of the regulatory requirements on additional construction trades such as plumbers, electricians, roofers and plasterers. OSHA has similarly overlooked the impact the Proposed Standard will have on self-employed construction workers. Although neither the OSH Act nor the Proposed Standard apply to self-employed workers, there are many reasons why the 2.5 million self-employed construction workers will be compelled in practice to perform dusty tasks in a manner consistent with the specifications in the proposed rule.

In the Agency's cost analysis, OSHA has also made the entirely impractical assumption that controls (e.g., wet methods, LEV) for the tools that construction workers use in performing tasks that generate respirable silica need be available only during the exact duration while a dusty task is performed. We estimate costs instead to provide control equipment on an "always available" basis to workers who engage in dusty tasks. Control equipment must be available whenever a worker *may need to perform* an at-risk task, and not for only the much more limited duration when the worker actually performs the at-risk task. It's usually difficult to predict exactly when and for how long a dusty task will be performed; in practice this means that appropriate silica-minimizing control equipment will need to be available virtually always to every construction worker who may occasionally perform an at-risk activity. Costs for the engineering controls required to meet the reduced PEL in the Proposed Standard will be far higher than OSHA estimates.

For these and other reasons, we estimate construction industry compliance costs from the Proposed Standard for Construction to be nearly $3.9 billion/year, nearly 8 times higher than OSHA's estimate of a little more than $500 million/year.

OSHA has also ignored the additional costs to the construction industry that will result from the Proposed Standard for General Industry. Many of the to-be-regulated general industries produce materials (e.g., concrete, brick, block, tile, stone, glass) and products (e.g., plumbing fixtures, roofing shingles, cast iron pieces, porcelain enameled electrical parts, insulation, paint) used in construction. As the Proposed Standard for General Industry causes costs to rise for the regulated general industries, these industries will pass some of their cost increases on to their construction industry customers in the form of higher prices, and these additional costs will have a further effect on construction industries that must be evaluated also.

We estimate the total cost that the Proposed Standard will impose on the construction industry at $4.65 billion per year, consisting of $3.9 billion/year in direct costs to comply with standard for the construction industry and $760 million/year in additional costs passed through as general

industries comply with their portion of the standard. The estimated pass-through costs add about 20% to the estimated direct costs.

Table 3: Total Costs for Construction Industry from Proposed Standard: Direct Costs from Construction Standard Plus Pass-Through Costs from General Industry Standard (in millions of 2009 dollars annually)

NAICS	Construction Industries	Direct Compliance Costs (Our estimate)	Cost Pass-Through from General Industry*	Total Costs From Entire Proposed Rule
236100	Residential Building Construction	$507,853,958	$77,949,968	$585,803,926
236200	Nonresidential Building Construction	$315,282,167	$234,480,071	$549,762,237
237100	Utility System Construction	$284,265,230	$73,373,572	$357,638,801
237200	Land Subdivision	$12,449,348	$9,545,837	$21,995,185
237300	Highway, Street, and Bridge Construction	$223,264,333	$72,271,351	$295,535,685
237900	Other Heavy and Civil Engineering Construction	$65,961,104	$14,547,871	$80,508,976
238100	Foundation, Structure, and Building Exterior Contractors	$721,956,879	$117,776,248	$839,733,127
238200	Building Equipment Contractors	$383,513,772	$22,331,258	$405,845,030
238300	Building Finishing Contractors	$490,644,056	$75,376,046	$566,020,102
238900	Other Specialty Trade Contractors	$705,527,401	$62,947,030	$768,474,431
999000	State and Local Governments	$181,187,235	N/A	N/A
	Total	$3,891,905,483	$760,599,251	$4,652,504,734

* Estimated based on: 1) Compliance costs for General Industry estimated by URS Corp. for ACC Crystalline Silica Panel, 2) Assumed 50% cost pass-through, 3) Construction industry inputs from each General Industry as given by IMPLAN.

OSHA makes additional errors in estimating the typical annual revenues and profits of the affected construction industries, against which compliance costs are compared in the Agency's economic feasibility screening analysis. The more significant of these errors include:

- OSHA uses revenue data for the year 2006 and profits averaged over the years 2000 through 2006 to portray the typical level of annual revenues and profits for the industry. This was an exceptionally good period economically for the industry, and the industry's financial performance during this period should not be assumed to represent the industry's ability to afford the costs of the Proposed Standard. Since 2006, the construction industry has suffered with the recession, the housing slump and the downturn in all segments of the business -- public and private; residential and commercial/industrial; new construction and repair and renovation. OSHA should use much more recent information to represent the typical levels of revenues and profits for the industry.

- OSHA's procedure for estimating revenues for the construction industries in years when the Economic Census has not been published (it was published in 2002 and 2007) is badly inaccurate. OSHA cannot accurately estimate revenues for any year more recent than 2007 until data become available from the 2012 Economic Census, projected to be sometime later this year.

- OSHA's procedure for estimating profits is inappropriate. Most importantly, OSHA's procedure considers the profitability of only the profitable firms in each industry, yielding a badly biased estimate. There's nothing in the Proposed Standard that says that only profitable firms/employers need to comply -- OSHA must assess economic feasibility for the entire affected industry, not only the profitable segment of it.

In addition to errors in estimating revenues and profits for the construction industries, OSHA conducts the entire economic feasibility screening analysis only for construction industries defined as 4-digit NAICS. Such large, aggregated industry groupings lump together construction industries that will be highly affected by the Proposed Standard with other unaffected construction industries that work minimally with silica-containing materials, thus diluting the perceived impact of the Proposed Standard.

We have been able to correct some, but not all, of OSHA's errors in estimating revenues and profits for the affected construction industries. We show below our partially revised version of OSHA's economic feasibility screening analysis, in which each affected construction industry's compliance costs are compared against the industry's revenues and profits. In this comparison, we estimate each industry's costs as the sum of our estimated direct and passed-through costs; we use OSHA's inappropriate revenue estimates because we cannot improve on them until the information from the 2012 Economic Census becomes available; and we estimate profits for each industry by multiplying OSHA's revenue estimates by our own, revised and better estimates for each industry's profitability. Despite our inability to improve this analysis so as to more fully represent the impact of the Proposed Standard on the construction sector, we find that the estimated regulatory costs will exceed OSHA's traditional revenue/profits thresholds for 8 of the 10 large, aggregated 4-digit construction industries. If we were able to improve on OSHA's inaccurate revenue estimates and analyze impacts on construction industries that are defined more tightly to reflect the more silica-intensive construction activities, we would undoubtedly find impacts even more significant than those shown below.

Our analysis on this basis shows that eight of the ten construction industries (defined in OSHA's aggregated manner that dilutes and reduces the calculated impact of the regulatory costs) will face compliance costs from the proposed rule that exceed the revenue/profits threshold. The proposed rule should be found to be economically infeasible on this basis.

Table 4: Estimated Total Costs (Direct + Pass-Through) of the Proposed Standard Exceed 10% of Profits for 8 of 10 Construction Industries

NAICS	Construction Industries	Total Costs as a % of OSHA's Revenues*	Total Costs as a % of Revised** Profits
236100	Residential Building Construction	0.53%	23.63%
236200	Nonresidential Building Construction	0.16%	7.37%
237100	Utility System Construction	0.34%	10.96%
237200	Land Subdivision	0.16%	-12.28%
237300	Highway, Street, and Bridge Construction	0.29%	9.19%
237900	Other Heavy and Civil Engineering Construction	0.39%	12.44%
238100	Foundation, Structure, and Building Exterior Contractors	0.50%	15.15%
238200	Building Equipment Contractors	1.28%	38.62%
238300	Building Finishing Contractors	0.53%	15.96%
238900	Other Specialty Trade Contractors	0.86%	25.97%
999000	State and Local Governments	N/A	N/A
	Total	0.43%	15.52%

* OSHA's revenue estimates are inaccurate, but cannot be corrected until data from the 2012 Economic Census become available

** "Revised" profits extend the averaging period for profits from 2000 - 2006 (OSHA) to 2000 - 2011 (revised) and calculate profitability for an industry across all corporations in that industry, not only those that were profitable in the year in question (as OSHA did)

II. Major Issues in OSHA's Cost Analysis.

Table 5, below, summarizes the major issues we identified in OSHA's cost analysis and have been able to address in our cost model. Table 5 also introduces the key differences in methodological approach that OSHA and we employ on each issue. The remainder of this section explains each of our issues with OSHA's cost analysis in more depth, expands on the problematic features of OSHA's approach, and contrasts them with the key features of our approach. We also discuss several additional smaller suggested changes or corrections to OSHA's cost analysis that we have not included in the table. The discussion in this section is intended as a summary explaining our reasoning for the changes and improvements that we have made to OSHA's procedures for estimating compliance costs for the Proposed Standard. This discussion should be read in conjunction with our cost analysis workbook. The workbook provides detail and references that we have not included in this summary discussion.

Table 5
Overview of Major Issues Concerning OSHA's Cost Estimates for the Proposed Silica Rule and Key Differences Between OSHA's and Our Approaches for Cost Estimation

Our Issue	OSHA's Approach	Our Approach
1. OSHA wrongly fails to count and include many construction occupations in the cost analysis	OSHA considers 19 construction occupations comprising 3.24 million workers who routinely engage in the 12 dusty tasks addressed by the Agency in its analysis.	We include nine additional construction occupations representing a further 1.26 million workers who also routinely engage in dusty tasks identical or similar to those addressed by OSHA in its analysis. We also add many more of the 0.86 million carpenters and helpers than OSHA includes.
2. OSHA fails to estimate the impact that the regulation will have on how self-employed workers perform construction work	The OSH Act and the Proposed Standard do not apply to self-employed workers	There are many reasons why the Proposed Standard in practice will eventually cause self-employed construction workers to perform construction tasks similarly as the standard will require for workers employed by covered employers. We include costs also for 1.43 million self-employed construction workers in occupations that routinely perform tasks at-risk of silica exposure
3. OSHA's cost analysis for engineering controls focuses on at-risk full time equivalents (FTE) instead of workers, resulting in drastically underestimating the need for and costs of control equipment (LEV, wet methods, etc.)	OSHA estimates costs to provide the control equipment prescribed in Table 1 to workers for only the amount of time that they are estimated to spend actually performing at-risk tasks producing respirable silica dust.	We estimate costs instead to provide control equipment on an "always available" basis to workers who engage in dusty tasks. Control equipment must be available whenever a worker may need to perform an at-risk task, and not for only the very limited duration when the at-risk task is actually being performed
4. OSHA's "productivity penalties" associated with using the controls mischaracterize and understate actual productivity losses.	OSHA estimates productivity losses involving labor only, reflecting only the additional work time (0 - 5%) needed to perform a task in the manner specified in Table 1	When a task takes longer to perform while using controls, both more labor and longer availability of control equipment are needed. We estimate productivity losses involving both labor and equipment, and estimate fixed and variable components for each

Our Issue	OSHA's Approach	Our Approach
5. OSHA's cost estimates for engineering controls do not reflect construction employers' inability to forecast accurately which at-risk workers will be over-exposed relative to a new PEL and when.	OSHA uses its task-level exposure profiles to estimate the percentage of times when an at-risk task is performed that it results in an exposure exceeding the proposed PEL. OSHA then assumes a need for controls and estimates costs only for the percentage of task performances when exposure would have been above the proposed PEL	In view of the numerous factors that can cause wide and unpredictable variation in the level of exposure when a dusty task is performed, we think it more realistic to assume that a prudent employer will provide controls in all instances when a task is performed that could lead to exposure exceeding the PEL. Furthermore, this costing approach is consistent with Table 1, which requires the listed dusty tasks always to be performed in the manner specified if the employer is to avoid monitoring
6. OSHA attempts to estimate costs and assess economic feasibility for only the incremental requirements that the Proposed Standard adds to existing requirements	Reasoning that current regulations already require exposure reduction for any workers now exposed at more than the current PEL (approximately 250 ug/m^3), OSHA estimates the incremental cost of the proposed standard as the cost to reduce exposures to below the proposed PEL for those employees now exposed at between 50 and 250 ug/m^3	We estimate and use for the economic feasibility assessment the "full" costs to reduce all current worker exposures to below the proposed PEL, not only the "incremental" costs beyond what the current standard requires. And, OSHA errs in estimating the "incremental" costs, since current regulations require employers to reduce exposures for those exposed above 250 ug/m^3 only to below that figure, not all the way to below 50 ug/m^3as OSHA's approach seems to imply
7. OSHA underestimates the costs of the ancillary provisions	OSHA uses its estimate of 1.8 million workers as the starting point for its estimates of workers who would be covered under each of the proposed ancillary program requirements	We disagree with some of OSHA's assumptions and estimates in projecting costs for the ancillary requirements. We also use a higher starting point, including both workers in OSHA's at-risk occupations and those in the additional at-risk occupations we identify. (But we do not assume that self-employed construction workers will be induced to meet the ancillary requirements)

A. OSHA fails to recognize and include in the cost analysis additional construction occupations that also conduct at-risk tasks and have significant exposures to respirable crystalline silica.

OSHA's analysis of the costs for engineering controls needed to reduce construction worker exposure to below the proposed PEL addresses only a limited set of construction occupations performing a limited set of construction tasks that can generate respirable crystalline silica. OSHA has inexplicably omitted from the Agency's analysis of the economic costs and impacts of the Proposed Standard at least 1.2 million additional workers in the construction industry who also routinely perform dusty tasks on silica-containing materials. These workers – members of large construction trades such as plumbers and plumber helpers, roofers, electricians and electrician helpers, and including specialty trades such as plasterers and stucco masons and helpers and tile and marble setters – perform tasks identical or similar to those performed by occupations included by OSHA in the Agency's cost analysis such as bricklayers, concrete finishers and construction laborers. Together the additional occupations increase OSHA's base estimate of the affected construction workforce by more than one-third.

Not only do workers in these additional occupations engage in some of the single tasks used by OSHA to identify other at-risk occupations (e.g., drilling holes in concrete or masonry to affix anchors as performed by carpenters), they are known to perform multiple silica-generating tasks during the course of their work day. For example, an electrician may both drill pass-through holes in masonry or other silica-containing construction materials using a hand-held drill and also open silica-containing wall, ceiling, and floor surfaces to install, repair or replace wiring, equipment, or fixtures.

On a first review of OSHA's cost analysis, it may appear that the Agency's limited set of selected tasks and occupations are intended only to be representative of the kinds of dusty work performed in construction. But no, OSHA intends its selective list to be exhaustive. OSHA has adopted a conceptual formulation that fails to capture the full extent of dusty tasks performed by construction workers and is deeply flawed for purposes of estimating at-risk employment and the resulting needs for control equipment and associated costs, as discussed below. The at-risk tasks performed by the additional occupations suggest a moderate increase OSHA's overall estimate of at-risk FTE. However, when workers in the additional occupations are considered under more realistic assumptions than OSHA's about deploying tools, equipment and controls across the construction work force, the increase in the number of the construction workers resulting from the addition of these occupations greatly affects the estimated control costs and "productivity penalties" when these additional workers perform silica-generating tasks. Moreover, the numbers also result in proportional increases in the costs associated with the proposed program's ancillary requirements, which are driven largely by the size of the affected construction workforce.

The following briefly describes and contrasts OSHA's and our methodological approaches.

OSHA's Approach: OSHA's analysis addresses only 19 of over 40 construction occupations identified in the Bureau of Labor Statistics' publication *Occupational Employment Statistics*, presumably because in the agency's view those occupations account for all of construction workers' time spent performing dusty tasks that generate respirable crystalline silica. OSHA's 19 occupations perhaps do account for much of the drilling, cutting, breaking, abrading and other construction work with silica-containing materials that result in potential silica exposures, but many other construction occupations also perform such tasks and generate sometimes significant silica exposures. OSHA's choice of occupations is consistent with its decision to use at-risk full-time equivalents (at-risk FTEs, see below), rather than actual worker counts, to characterize the at-risk work force engaging in dusty tasks.

Our Approach: An examination of OSHA's approach reveals two types of omissions.

- OSHA has failed to include other occupations that include large numbers of construction workers who routinely engage in drilling, cutting, breaking and abrading of masonry and other silica-laden materials, albeit often for fractions of worker time smaller than many (but not all) of OSHA's selected occupations.

- OSHA's profile for carpenters, one of the largest construction occupations addressed in the Agency's analysis, includes only hole-drilling into masonry materials for the purpose of affixing anchors, while failing to include other silica-exposure-generating tasks commonly performed by carpenters such as sawing through masonry; demolition or removal of silica-containing walls, ceilings or floors; drilling through brick, block or plaster for the purpose of passing something through the hole rather than affixing an anchor; grinding or otherwise abrading surfaces such as stone countertops or plaster and lath walls; and more. These additional tasks may individually amount to small fractions of a carpenter's work day, but most carpenters will perform one or more of such tasks at least weekly, if not daily. Taken together, these additional at-risk tasks contribute to an increased exposure profile in which the typical carpenter is spending several times more than the 1% of his work year that OSHA estimates performing dusty tasks.

The additional construction occupations that we include in cost analysis account for 1.26 million additional workers beyond OSHA's occupations, and the additional carpenter time that we also include results in three times as many affected carpenter FTEs as OSHA estimates among the 860,000 carpenters and helpers.

We included these additional occupations, workers and tasks in our analysis as follows.

We consulted a much broader set of sources than did OSHA to identify construction occupations that routinely perform tasks that generate respirable crystalline silica. OSHA developed the Agency's list of representative at-risk construction jobs largely by reviewing the RS Means publication *Heavy Construction Cost Data*. We reviewed additionally the RS Means

publications that address residential and remodeling construction work rather than heavy construction: RS Means *Residential Cost Data*, and RS Means *Repair and Remodeling Cost Data*. OSHA has missed many dusty construction tasks and the occupations that perform them in residential and repair/remodeling settings. We also consulted the NIOSH-supported Center for Construction Research and Training's "Silica-Safe" web site (http://plan.silica-safe.org/), which identified a long list of construction materials containing silica and construction tasks involving these materials that would likely generate respirable crystalline silica.[1] We also discussed OSHA's incomplete list of construction tasks and occupations with members of the CISC and received many suggested additions. One list of suggested additions for residential construction alone included more than 20 tasks that OSHA had not included:

- Mixing mortar
- Loading, hauling, dumping rock/stones/sand
- Demolishing concrete and masonry structures
- Demolishing drywall or plaster walls/ceilings
- Installing erosion control
- Digging trenches
- Miscellaneous moving, loading, hauling, and dumping of dirt, rocks, and stones
- Pouring concrete footers, slab foundation, and/or foundation walls and the removal of formwork
- Finishing concrete, such as screeding, bullfloating, jointing, floating, troweling, patterned-stamping the surface, and installing control or expansion joints.
- Post-Tension concrete slab work
- Overhead drilling
- Handling and installing brick, block, or stone
- Backfilling soil and rock around house foundation
- Attaching sill plates to foundation
- Installing and/or removal of ceramic tile roofs, slate and asphalt shingles
- Installing fiber-cement board prior to installation of ceramic tiles or stucco
- Grouting floor and wall tiles
- Installing granite or quartz counter tops
- Placing stones and soil during landscaping activities
- Erecting and installing pre-cast concrete beams, columns and panels
- Boring or drilling in the ground to access groundwater in underground aquifers
- Installing concrete and clay tiles on roof

[1] The Silica-Safe web site lists the following common construction materials containing silica: asphalt, brick, cement, concrete, concrete block, drywall, fiber cement products, grout, gunite/shotcrete, mortar, paints containing silica, plaster, refractory mortar/castables, refractory units, rock, roof tile (concrete), sand, soil (fill dirt and top soil), stone, (including: granite, limestone, quartzite, sandstone, shale, slate, cultured, etc.), stucco/EIFS, terrazzo, and tile (clay and ceramic). The web site lists all the following construction activities that may be performed on these materials and generate silica: abrasive blasting, bushhammering, cutting/sawing, demolishing/disturbing, drilling/coring, earthmoving, grinding, jackhammering, milling, mixing/pouring, polishing, sacking/patching, sanding, scabbling, scarifying, scraping, sweeping/cleaning up, and other. Many more construction occupations perform these activities on these materials beyond those that OSHA has included in the Agency's cost analysis.

We decided ultimately to add nine construction occupations to the cost analysis: Tile and Marble Setters, Electricians and Electrician Helpers, Plumbers and Plumber Helpers, Plasterers and Plasterer Helpers, and Roofers and Roofer Helpers. Table 6 provides an overview of our additional occupations and associated employee counts, which total about 1.26 million workers across the 11 4-digit construction NAICS.

Table 6. Nine Construction Occupations That We Added to Cost Analysis

	Tile and Marble Setters	Electricians and Helpers	Plumbers and Helpers	Plasterers and Helpers	Roofers and Helpers	Total
Residential Construction	2,237	7,220	4,906	2,104	3,206	19,673
Nonresidential Building Construction	221	9,726	17,536	915	100	28,498
Utility System Construction	0	6,107	25,185	100	0	31,393
Land Subdivision Construction	0	50	50	0	83	183
Highway, Street, and Bridge Construction	0	794	744	100	0	1,638
Other Heavy and Civil Engineering Contruction	0	1,026	1,235	50	0	2,311
Foundation, Structure, and Building Exterior Contractors	50	455	2,139	11,550	142,523	156,716
Building Equipment Contractors	50	530,769	361,885	66	798	893,567
Building Finishing Contractors	39,594	50	100	45,887	1,623	87,255
Other Specialty Trade Contractors	1,257	1,249	3,508	1,424	374	7,811
Adjusted State and Local Government	50	19,250	15,200	640	240	35,380
Total	43,459	576,697	432,488	62,836	148,947	1,264,425

More than 120 data samples showing meaningful exposure to respirable crystalline silica are available for these trades, cited in either the Preliminary Economic Analysis (PEA) or Beaudry, et. al. (2013).[2]

We could reasonably have added even more occupations to the analysis. For example, we received information to the effect that HVAC mechanics and installers frequently drill into concrete to install piping and other equipment.

For each of these 9 added occupations and for additional carpenter FTEs that OSHA had not included, we identified the silica-generating tasks they commonly perform and estimated the fraction of their work-years that they spend performing these tasks. For each of these occupations, we also selected one of the construction tasks that OSHA had analyzed that we thought was most similar to the bulk of the work that the added occupation performs. For Plasterers and Stucco Masons, for example, we judged that Drywall Finishing is the one of OSHA's tasks most similar to the work they perform. We selected a "most representative" task from among OSHA's list for each of our added occupations and applied to each of these added occupations the information that OSHA had developed regarding the appropriate controls needed to perform the representative task in a manner that would minimize silica exposures. We did not develop our own independent estimates regarding the control measures needed to protect these added occupations, nor for the costs of these control measures. For the occupations that OSHA

[2] Beaudry, et al. (2013). Charles Beaudry, Chantal Dion, Michel Gérin, Guy Perrault, Denis Bégin and Jérôme Lavoué. Construction Workers' Exposure to Crystalline Silica: Literature Review and Analysis. Institut de Recherche Robert-Sauvé, Report R-771. 2013.

did include in the analysis and that we added, we simply applied OSHA's estimates for controls and costs (both equipment costs and productivity penalties) for what we judged was the "most representative task" among those that OSHA had analyzed. Thus, for Plasterers and Stucco Masons for example again, we assumed that the controls they would need in order to minimize silica exposures and the costs they would incur when using these controls would be the same as those OSHA had chosen for Drywall Finishing. Table 7, below, shows the fraction of a work year that we estimated members of each of our added occupations spends performing construction tasks at-risk of silica exposure, and the one of OSHA's tasks that we judged as "most representative" for each of these added occupations. For Plasterers and Stucco Masons for example again, we estimated that they spend 27% of their time performing at-risk tasks, consisting of 25% of their time performing surface finishing (like Drywall Finishers, with similar controls and costs), 1% of their time drilling anchor holes, and 1% of their time drilling holes through which something is to be passed (e.g., electrical wiring).

Table 7 shows the FTE that we add to the cost analysis in these additional occupations and in the form of more carpenter FTEs. The nearly 85,000 FTE that we add represents a 13% increase over the total that OSHA included in the Agency's cost analysis. We believe this increase is quite conservative; a reasonable case could be made that many more construction workers than these also routinely perform work that generates respirable silica exposures.

Table 7. Additional At-Risk Occupations and Tasks

At-Risk Occupation	OSHA: At-Risk Tasks Performed in this Occupation and Included in the Cost Analysis	Us: Additional Drilling Tasks Sample Tools: Rotary hammer, drills	Us: Additional Sawing, Breaking and Demolition Tasks Sample Tools: Reciprocating saw, chop saw, angle grinder, various other saws with masonry blades, wide range of demolition/teardown tools and equipment	Us: Additional Grinding, Sanding and Abrasive Surface Finishing Tasks Sample Tools: Grinder, sander, angle grinder, milling machines	Us: Total Additional Fraction of Time Spent Performing At-Risk Tasks	OSHA Task That We Think Most Similar to These Additional Tasks and That We Use To Represent the Controls and Costs for These Additional Tasks
Carpenter and Carpenter Helper	(1) Drilling holes for anchors using hand-held drill (.01)	(2) Drilling holes to pass things through (e.g., conduit) using hand-held drill (.01)	(3) Inspect and replace damaged framework or other structures or fixtures. (.01)	(4) Fill cracks and other defects in plaster or plasterboard and sand patch, using patching plaster, trowel, and sanding tool. (.01)	0.03	Hole drilling using hand-held tools
Plumber and Plumber Helper	None	(1) At-risk task in common with Carpenters: Drilling anchor holes using hand-held drills (0.1) (2) Drilling pass-through holes using hand-held drill (.01)	(3) Cut holes in walls, ceilings and floors (.01)		0.03	Hole drilling using hand-held tools
Electrician and Electrician Helper	None	(1) Drilling pass-through holes using hand-held drill (.01)	(2) Open wall, ceiling and floor surfaces to repair or replace wiring, equipment, or fixtures. (.01)		0.02	Hole drilling using hand-held tools
Tile and Marble Setters	None	(1) At-risk task in common with Carpenters: Drilling anchor holes using hand-held drills (0.1) (2) Drilling pass-through holes using hand-held drill (.01)	(3) Cut, surface, polish and install marble and granite and/or install pre-cast terrazzo, granite or marble units. At-risk task in common with Brickmasons, Blockmasons and Stonemasons: cutting masonry with a portable saw (.22)	(4) Remove any old tile, grout and adhesive using chisels and scrapers. (.01) (5) Clean and level the surface to be tiled (.01)	0.26	Masonry cutting using portable saws
Plasterers and Stucco Masons and Helpers	None	(1) At-risk task in common with Carpenters: Drilling anchor holes using hand-held drills (0.1) (2) Drilling pass-through holes using hand-held drill (.01)		(3) At-risk task in common with Drywall Finishers: surface finishing (.25)	0.27	Drywall finishing
Roofers and Helpers	None	(1) At-risk task in common with Carpenters: Drilling anchor holes using hand-held drills (0.1) (2) Drilling starter holes for sawing (.01)	(3) Cut roofing materials to fit angles formed by walls, vents, or intersecting roof surfaces (.01)	(4) Punch holes in slate, tile, terra cotta, or wooden shingles, using punches and hammers. (.01)	0.04	Hole drilling using hand-held tools

Table 8. Additional FTE in Cost Analysis from Added Occupations and More Carpenters

	Carpenters & Helpers, Incremental	Tile and Marble Setters	Electricians and helpers	Plumbers and helpers	Plasterers and helpers	Total
Est. Fraction of Time Spent on Our Additional At-Risk Tasks	0.03	0.26	0.02	0.03	0.27	
	Additional beyond OSHA's FTEs; OSHA estimated only 1% of carpenter time to be at-risk, on the hole drilling task					
Our Additional FTEs:						
Residential Construction	9,908	582	144	147	568	11,478
Nonresidential Building Construction	4,668	57	195	526	247	5,697
Utility System Construction	246	0	122	756	27	1,150
Land Subdivision Contruction	65	0	1	2	0	70
Highway, Street, and Bridge Construction	419	0	16	22	27	484
Other Heavy and Civil Engineering Contruction	167	0	21	37	14	238
Foundation, Structure, and Building Exterior Contractors	5,014	13	9	64	3,118	13,919
Building Equipment Contractors	237	13	10,615	10,857	18	21,772
Building Finishing Contractors	4,415	10,295	1	3	12,390	27,168
Other Specialty Trade Contractors	378	327	25	105	384	1,235
Adjusted State and Local Government	317	13	385	456	173	1,354
Total	25,833	11,299	11,534	12,975	16,966	84,565

B. OSHA fails to estimate the impact that the Proposed Standard will have on how self-employed workers will perform construction work

The Occupational Safety and Health Act and the Proposed Standard do not apply to self-employed workers. Nevertheless, we believe that the Proposed Standard will cause self-employed construction workers eventually to perform silica-generating tasks in the same manner as the Proposed Standard will require of regulated employers and their workers. Several factors will influence self-employed construction workers to perform their work consistent with the engineering control requirements in the Proposed Standard:

- Concerned, self-interested self-employed workers will recognize the Table 1 specifications as the safe way to perform their work;

- Construction general contractors will demand that anyone working on their site, whether self-employed or not, do the job safely and in conformity with regulatory requirements;

- Regulated construction trade contractors will demand a level playing field relative to their self-employed competitors; and

- Regulated construction workers working with or near self-employed workers will demand that they not suffer increased silica exposures from inappropriate practices by self-employed workers.

We think it reasonable to expect that all self-employed construction workers will eventually come to perform silica-generating tasks consistent with the Table 1specifications in the Proposed Standard. We believe the costs for self-employed workers to change their practices in this manner should be counted as a cost of the Proposed Standard -- absent the Proposed Standard, they would not perform their work in this way and would not incur the costs of doing so.

We do not believe, though, that self-employed workers will be induced to meet the ancillary requirements of the Proposed Standard. We assume that they will choose not to incur costs to comply with administrative requirements.

OSHA's Approach: OSHA does not address self-employed construction workers in the Agency's cost analysis. Presumably OSHA believes that the Proposed Standard will not affect self-employed workers since the Standard does not apply to them.

Our Approach: We estimate engineering control costs for self-employed workers to perform silica-generating tasks in exactly the same manner as the Proposed Standard will require of regulated employers and their workers. We assume that self-employed workers in a construction

occupation that OSHA includes in the Agency's cost analysis (e.g., brickmasons and blockmasons) will perform at-risk tasks (e.g., grinding and tuckpointing, masonry cutting with portable saws, masonry cutting with stationary saws) in the same manner and will incur similar control costs as will workers in the same occupation who are employed by a regulated employer. We also assume that self-employed workers in the at-risk occupations that OSHA does not include in the Agency's analysis but which we add (e.g., plumbers) will incur similar control costs as will regulated workers in the at-risk occupations that we add.

The Bureau of Labor Statistics conducts a semi-annual survey (the Occupational Employment Survey, or OES) that provides information on the number of individuals in each of hundreds of different occupations who are employed by businesses in each of hundreds of different industries. This survey is the source for OSHA's estimates for the number of employees in each construction occupation who are covered by the Proposed Standard in each of the 4-digit construction industries. We refer to these employees in our cost workbook as "OSHA's workers". We used the OES also to identify the number of additional employees in construction occupations that OSHA had omitted but who are also covered by the Proposed Standard. We refer to these employees in our cost re-estimating workbook as "Our additional workers".

There is no similar survey that provides parallel information on the number of self-employed individuals in different occupations who are employed in the different 4-digit construction industries. The U.S. Census Bureau, in *Revised 2008 Nonemployer Statistics Reflecting 2009 Methodology Changes*, provides information on the number of self-employed individuals ("nonemployers") working in each of the 4-digit construction industries (total of 2.52 million self-employed construction workers), but no further information on the occupations of these self-employed workers. In order to estimate the number of self-employed workers in each of the various at-risk construction occupations that OSHA identified and that we added, we simply assumed that these 2.52 million "nonemployers" are distributed among occupations within each construction NAICS in the same proportion as employed workers are distributed among occupations within the NAICS.

Tables 9 and 10 show the number of self-employed construction workers that we added to the cost analysis in this manner, compared with the numbers of regulated construction employees that OSHA had included in the Agency's analysis and with the number of regulated construction employees in occupations that OSHA had omitted but we added.

Including self-employed workers in the cost analysis increased the number of workers in OSHA's occupations (masons, etc.) by 1.18 million beyond the 3.26 million workers in these occupations employed by regulated construction employers. Adding self-employed workers increased the number of workers in our additional occupations (plumbers, etc.) by 628,000 relative to the 1.26 million workers in these occupations employed by regulated construction employers.

Table 9: Self-Employed Workers Added to Cost Analysis Relative to Employed Workers in Occupations that OSHA Included

OSHA's included workers employed by regulated employers:

	Drywallers	Earth Drillers	Heavy Equipment Operators	Grinders and Tuck Pointers	Hole Drillers	Impact Drillers	Millers	Masons Using Portable Saws	Masons Using Stationary Saws	Rock Crushers	Tunnelers	Abrasive Blasters	Total
Residential Building Construction	5,725	0	36,982	36,271	364,568	87,369	33,395	7,828	2,389	0	0	0	574,527
Nonresidential Building Construction	1,930	0	62,664	45,398	167,915	61,710	40,205	10,788	3,904	0	0	0	394,515
Utility System Construction	50	63,990	118,675	3,372	8,435	14,986	6,693	382	229	258	0	0	217,070
Land Subdivision	0	0	6,440	709	2,234	2,516	1,178	0	0	0	0	0	13,076
Highway, Street, and Bridge Construction	0	1,387	113,438	11,442	14,453	17,006	43,642	40	22	808	0	0	202,237
Other Heavy and Civil Engineering Construction	50	3,715	29,445	1,264	5,708	3,819	2,279	111	69	352	0	0	46,813
Foundation, Structure, and Building Exterior Contractors	590	0	20,950	141,753	171,882	19,425	111,964	109,506	67,047	233	0	0	643,349
Building Equipment Contractors	50	5,238	31,547	3,362	8,613	77,971	965	566	187	0	0	0	128,499
Building Finishing Contractors	143,229	0	265	28,243	156,262	19,666	9,532	16,112	6,808	13,935	0	11,043	405,094
Other Specialty Trade Contractors	50	18,228	189,819	24,247	12,944	17,435	52,880	4,039	2,569	238	2,662	4,403	329,514
State and Local Government	0	349	184,588	1,401	10,748	73,246	29,348	313	231	545	0	0	300,770
	151,674	92,907	794,813	297,461	923,762	395,149	332,081	149,684	83,456	16,368	2,662	15,446	3,255,464

Additional self-employed workers in OSHA's occupations:

	Drywallers	Earth Drillers	Heavy Equipment Operators	Grinders and Tuckers	Hole Drillers	Impact Drillers	Millers	Masons Using Portable Saws	Masons Using Stationary Saws	Rock Crushers	Tunnelers	Total
Residential Building Construction	3,377	0	21,814	21,356	215,043	51,442	19,830	4,617	1,409	0	0	338,889
Nonresidential Building Construction	221	0	7,361	5,321	19,725	7,233	4,751	1,267	459	0	0	46,338
Utility System Construction	0	1,085	2,013	57	143	255	114	5	3	0	0	3,675
Land Subdivision	0	0	1,322	145	458	515	244	0	0	0	0	2,684
Highway, Street, and Bridge Construction	0	30	2,564	252	322	399	971	0	0	18	0	4,556
Other Heavy and Civil Engineering Construction	0	848	6,587	271	1,271	872	519	0	0	0	0	10,368
Foundation, Structure, and Building Exterior Contractors	134	0	5,183	35,026	42,504	4,800	27,752	27,087	16,580	0	0	159,064
Building Equipment Contractors	0	0	4,554	406	1,230	11,996	0	72	23	0	0	18,280
Building Finishing Contractors	102,812	0	0	20,300	112,203	14,122	6,808	11,602	4,887	10,016	0	282,749
Other Specialty Trade Contractors	0	17,881	186,415	23,793	12,707	17,106	52,055	3,966	2,522	0	0	316,445
	106,543	19,843	237,812	106,927	405,606	108,740	113,042	48,616	25,883	10,034	0	1,183,047

Table 10: Self-Employed Workers in Our Added Occupations Relative to Employed Workers in Our Added Occupations

Workers in our additional occupations and employed by regulated businesses that we added to the cost analysis:

	Tile and Marble Setters	Electricians and Helpers	Plumbers and Helpers	Plasterers and Helpers	Roofers and Helpers	Total	Carpenters and Helpers
Residential Construction	2,237	7,220	4,906	2,104	3,206	19,673	330,276
Nonresidential Building Construction	221	9,726	17,536	915	100	28,498	155,594
Utility System Construction	0	6,107	25,185	100	0	31,393	8,190
Land Subdivision Construction	0	50	50	0	83	183	2,152
Highway, Street, and Bridge Construction	0	794	744	100	0	1,638	13,969
Other Heavy and Civil Engineering Contruction	0	1,026	1,235	50	0	2,311	5,556
Foundation, Structure, and Building Exterior Contractors	50	455	2,139	11,550	142,523	156,716	167,130
Building Equipment Contractors	50	530,769	361,885	66	798	893,567	7,900
Building Finishing Contractors	39,594	50	100	45,887	1,623	87,255	147,151
Other Specialty Trade Contractors	1,257	1,249	3,508	1,424	374	7,811	12,616
Adjusted State and Local Government	50	19,250	15,200	640	240	35,380	10,580
Total	43,459	576,697	432,488	62,836	148,947	1,264,425	861,113

Self-employed workers in our additional occupations that we added to the cost analysis:

	Tile and Marble Setters	Electricians & Helpers	Plumbers & Helpers	Plasterers & Helpers	Roofers & Helpers	Total	Additional Carpenters & Helpers
Residential Building Construction	1,319	4,259	2,894	1,241	1,862	206,390	194,815
Nonresidential Building Construction	26	1,142	2,060	102	0	21,608	18,278
Utility System Construction	0	103	426	0	0	669	139
Land Subdivision	0	0	0	0	17	459	442
Highway, Street, and Bridge Construction	0	17	17	0	0	344	311
Other Heavy and Civil Engineering Construction	0	228	275	0	0	1,740	1,237
Foundation, Structure, and Building Exterior Contractors	0	100	529	2,856	35,243	80,057	41,328
Building Equipment Contractors	0	75,684	51,603	9	114	128,536	1,126
Building Finishing Contractors	28,422	0	0	32,939	1,129	168,117	105,628
Other Specialty Trade Contractors	1,234	1,226	3,444	1,398	367	20,053	12,385
Total	31,001	82,760	61,247	38,544	38,732	627,972	375,688

Table 11 provides a summary showing the additional workers and additional FTE that we include in our cost analysis relative to the numbers of workers and FTE that OSHA had included in the Agency's cost analysis. By adding additional occupations that perform at-risk tasks that OSHA had overlooked and by adding self-employed workers, we increase the estimated number of at-risk workers by 94% (from 3.26 million to 6.33 million) and we increase the estimated number of FTE performing silica-generating tasks by 54% (from 637,224 to 979,571).

Table 11: Summary Impact of Adding Occupations and Adding Self-Employed Workers on Estimated Numbers of At-Risk Workers and Exposed FTEs

	In OSHA's Occupations (e.g., masons)	In Our Added Occupations (e.g., plumbers)	Total
Workers			
Workers employed by regulated employers	**3,255,464**	1,264,425	4,519,889
Self-employed workers	1,183,047	627,962	1,811,009
Total	4,438,511	1,892,387	6,330,898
FTE			
FTE employed by regulated employers	**637,244**	84,565	721,809
Self-employed FTE	222,982	34,780	257,762
Total	860,226	119,345	979,571

In our cost estimation calculations in the workbook, we show separately the costs we estimate for the workers that OSHA identified as performing at-risk tasks, the costs we estimate for the additional workers in construction occupations that OSHA had missed, and the costs we estimate for self-employed workers.

C. OSHA's analysis focusing on FTEs instead of workers results in drastically underestimating control costs involving equipment (LEV, wet methods, etc.).

By relying on highly unrealistic assumptions about control equipment deployment and use in the construction industry, OSHA grossly underestimates the costs of complying with the engineering requirements of the Proposed Standard. The Agency appears to believe that control equipment can be deployed in a precisely limited fashion exactly when, and only when, a worker actually engages in a dusty task, instead of making the appropriately controlled equipment available at all times when there is some possibility that a dusty task may need to be performed, as is routinely the case for workers in many construction occupations. According the Agency, engineering control costs are incurred only while workers are actively engaged in dusty tasks, estimated by OSHA to average less than 20 percent of the time construction workers spend on the job.

This assumption would hold true only under two highly unrealistic conditions: i.e., employers know exactly when and where workers will engage in OSHA's at-risk tasks and employers have the ability to deploy and then instantly remove engineering controls to match the episodic nature

of the silica-generating activities. Thus, perhaps without conscious intent, but in practical effect, OSHA introduces us to the theoretical employer of a construction worker who can exactly predict when and where and for how long this employee will drill a hole in one or another type of silica-containing material. When the worker initiates the dusty task the appropriate control equipment immediately becomes available, and as soon as the task is completed, the employer instantly transfers the protective shroud and LEV used by the worker for his drill, and the HEPA vacuum used to clean up, to another worker in similar need, or back to the equipment rental service, which accepts the returned equipment for a rental charge reflecting only the precise amount of time that the worker used the control equipment to complete the drilling task.

In fact, construction crews who routinely engage in dusty tasks will need to have appropriately controlled equipment on hand and available virtually all the time, whenever there is a possibility that the job at hand requires them to perform a dusty task.

OSHA offers no evidence to suggest that the Agency, or more importantly, construction industry employers know when and where OSHA's estimated 637,000 work years of silica-generating construction activities will occur. Absent this unavailable information, the prudent employer must ensure that appropriate engineering controls will always accompany and be available for all construction crews who may engage in dusty tasks. The effect of this alternate, more realistic assumption is reflected in our revised cost estimates.

The following briefly describes and contrasts OSHA's and our methodological approaches.

OSHA's Approach: OSHA characterizes the need for protective equipment controls prescribed in Table 1 using an estimate of at-risk FTEs representing the time spent on dusty tasks by workers in the construction industry. The Agency's approach for estimating the number and distribution of at-risk FTEs across dusty tasks and industries is as follows:

- Select the 19 occupations judged to engage most heavily in 12 dusty tasks chosen as the focus of its analysis.

- Within each of the selected occupations, estimate the fraction of individual worker time spent on each of its selected 12 dusty tasks.

- Within each of the 11 4-digit, construction NAICS industries, allocate fractions of the occupational worker counts to the 12 dusty tasks according to the estimates of time spent by those occupations on each of the tasks. These worker fractions embody a representative job and crew analysis that assigns key and secondary workers with job roles and corresponding amounts of time spent working on or near the dusty task.

The result is a distribution of at-risk FTEs across dusty tasks and industries consistent with OSHA's assumptions about the duration of potential exposure to silica dust, work relationships among crew members, and equipment required to perform its 12 dusty tasks. Control equipment

requirements and costs are then estimated by OSHA in an amount exactly sufficient to match the total number of hours during a year during which dusty tasks are estimated to be performed and controls are assumed to be needed and used. OSHA makes no provision for controls to sit idle for any period of time.

Our Approach: We characterize the need for control equipment by identifying workers who engage in dusty work frequently but episodically and unpredictably, and estimate costs sufficient to make the necessary controls available whenever the dusty task may be performed. In most instances, this means making the needed controls available to a worker at all times when he may have occasion to perform an at-risk task. In our formulation, a control very often sits idle. The employer must pay to make the control available at all times when the worker may need it, even though during much of his work day or work year the worker will not be performing the dusty task and in fact won't be using the control.

Consider a carpenter who occasionally drills holes in masonry to attach framing or other items. When he drills these holes, according to Table 1 he should use a drill equipped with a dust collection shroud and a vacuum hose connecting the drill to a HEPA vacuum that will collect the drill dust as it is generated. On Monday the carpenter is assigned to work on the first floor of a building where three times during the day (at (9:15 AM, at 2 PM, and at 2:05 PM) he spends five minutes each time drilling into a concrete floor to attach framing. On Tuesday he is assigned to work on the second floor where there are only wood materials to work with, and he does no drilling into silica-containing materials. On Wednesday, he is assigned to work in the basement, which has a concrete floor and masonry walls, and he spends half the day drilling and anchoring things to these silica-containing materials. For how much time does this carpenter need the shroud, vacuum hose and HEPA vacuum over these three days? Is it practical, as OSHA supposes in the Agency's analysis, for the carpenter to rent the control equipment for exactly 15 minutes on Monday (for exactly five minutes at each of 9:15, 2 and 2:05), not at all on Tuesday, and then on-and-off on Wednesday for a total of 4 hours? Or is it practical for the carpenter's employer to provide him with the control equipment for exactly these times and no more? We think not. The much more realistic approach, as pursued in common practice by carpenters and employers, will be to make the controls available to the carpenter every day for the entire day, so that he will be able to perform the drilling task appropriately whenever the work at hand requires him to perform the task.

We believe that this is the appropriate way to think about control equipment needs and costs for most or perhaps all of the at-risk tasks. Certainly a crew of bricklayers can't have the hose, water reservoir and water spray available for their stationary brick saw only for those exact times during the day when a brick is being cut. They will need to have the control equipment set up at the start of the day so that it will be available whenever they cut a brick, and they will either take it down and the end of the day or leave it set up overnight (then staying idle for 2/3 of a day) so that it's ready for the next morning. The approach might even be similar for enclosed cabs, HEPA filters, door seals, etc. on heavy equipment, which are among the most costly of the

equipment controls that OSHA envisions for an at-risk task. We doubt that a bulldozer operator will know enough about the job site where he will be working tomorrow to know whether to bring his bulldozer with an enclosed cab or his bulldozer without one -- he likely won't know, for example, whether the site will be mostly sandstone and will yield high concentrations of silica in the dust that's worked up, or whether it will be mostly limestone and silica concentrations will be low. And, even if the operator or the employer did know this, it won't often be the case that there will be a realistic option depending on the site conditions to bring to the site either an enclosed cab bulldozer or one without an enclosed cab. The answer may be, just as it is for the hole drilling controls and the brick saw controls, that one needs to incur the costs to have the controls available virtually always; whenever there is at least some possibility that they will be needed.

In our view, if OSHA is to think realistically about how often engineering controls will be needed for dusty tasks and what the costs may be for these controls, the Agency should abandon its current approach that begins with the total amount of time (or FTE) during a year during which the dusty task is performed. Instead, OSHA should begin by thinking about how large is the inventory of tools used to perform the dusty task that may need to be controlled. Does every one of the 860,000 carpenters and carpenter helpers in the U.S. at least occasionally drill into concrete or masonry, does every one of these workers have his own drill, and does every one of these drills need to be provided with appropriate controls that will be available whenever the drill may be used? Should OSHA estimate control equipment costs for the hole drilling task by figuring out how much it would cost for controls for 860,000 drills?

In our cost estimation workbook, we start with this sort of presumption, but then consider several factors that could either increase or decrease the number of sets of control equipment needed to something more or less than the number of workers in the occupation that may perform the at-risk task. More specifically, we consider:

- What percentage of workers in an occupation that sometimes performs the at-risk task ever perform the task during a year?

- What is the size of the typical crew that performs the at-risk task? It's often the case that only one tool will serve the entire crew in performing the at-risk task, and hence only one set of controls will be needed for the crew. A crew of several brick masons will need only one stationary brick saw, and similarly only one hose, water reservoir and set of spray equipment. But how many carpenters constitute a hole-drilling crew?

- Can a single set of controls be shared across more than one crew? In considering this, we concluded that the higher the fraction of a work year that a worker spends performing the at-risk task, the less likely he is to be able to share a set of controls with other workers or crews. A heavy equipment operator, who OSHA estimates spends 75% of his work hours

during a year performing the dusty task of operating heavy equipment, is quite unlikely to be able to share his controls (his enclosed cab) with another heavy equipment operator. The first operator is nearly always in his cab operating his equipment; he thus can't share it with a second operator. The carpenter, on the other hand, if he really spends only 1% of his time hole drilling and using the hole drilling controls as OSHA estimates, can probably share those controls rather easily with another carpenter.

- A factor that goes in the other direction, tending to increase the number of sets of controls needed to a figure greater than the number of individuals performing the at-risk task, is whether there may be more than one sort of tool with which to perform the at-risk task that may need to be controlled in somewhat different ways. A carpenter, for example, likely has both a drill for drilling into masonry and some sort of saw for sawing through masonry, and perhaps even some sort of grinder for sanding or abrading masonry. The controls for each of these tools are likely to be rather different; the shroud, attachment and vacuum hose for the carpenter's hammer drill likely won't also fit the carpenter's reciprocating saw.

We discussed these issues with knowledgeable construction trades people, and came to the judgments shown in the table below, which is reproduced from Tab #6 in our cost estimation workbook, titled "Equipment Cost - OSHA workrs".

Table 12. Factors that we use to scale down or up from number of workers in occupations that perform at-risk tasks to number of tools/machines that will need to be controlled

	Drywallers	Earth Drillers	Heavy Equipment Operators	Grinders and Tuck Pointers	Hole Drillers	Impact Drillers	Millers	Masons Using Portable Saws	Masons Using Stationary Saws	Rock Crushers	Tunnelers
Percentage of workers in OSHA's key and secondary occupations assumed to participate at least once per year in a crew that performs the at-risk task	80%	20%	80%	25%	80%	25%	40%	50%	50%	80%	100%
Factors that scale down:											
Average Crew Size	2.0	3.0	1.5	1.5	1.0	5.0	4.0	2.0	3.0	7.0	30.0
Sharing Factor	1.0	1.0	1.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0	1.0
Factors that scale up:											
Number of tools/machines to be controlled/crew	1.0	1.0	1.0	2.0	1.0	3.0	1.0	1.0	1.0	1.0	1.0
(explanation if multiple tools/machines)				flush grinder, saw/angle grinder		3 pneumatic tools/crew					
Total Adjustment	0.400	0.067	0.533	0.167	0.400	0.075	0.050	0.125	0.083	0.114	0.033

During the CISC testimony at the public hearing on the Proposed Standard on March 24, 2014, we discussed these issues with OSHA staff. OSHA staff asked whether, if one were to think in the manner we are suggesting about control equipment being always available whenever the at-risk task might be performed, the useful life of the control equipment would be much longer than what OSHA had estimated in the Agency's cost analysis. Our answer at the time was that we agreed; if a piece of control equipment is to sit idle for much of the time that it is available, it will last substantially longer than if it were to be used for all of the time that it is available as OSHA had supposed in the Agency's cost analysis. After additional thought and discussion about this issue with several construction tradespeople, we developed an approach on the useful life issue that is shown in our cost estimation workbook in Tab # X2B, titled "Hole Drilling Unit Costs". We concluded that useful life is a function of both how often the tool and controls are used, but also how long they sit in the construction worker's truck and get bounced around going from job site to job site (even when they are not used), and how often they are taken out of the truck and returned to the truck (even when they are only set up then taken down at the job site but not actually used). Thus useful life will increase if a tool sits idle for some percentage of the time when it is available, but useful life will not increase to the same proportional extent as the decrease in usage. We assumed in the example in workbook Tab # X2B that using the tool and equipment 1/4 as often will double its useful life.

D. OSHA's productivity penalties understate actual productivity losses.

OSHA's estimates of the percentage losses in time, or productivity penalties, involved in conducting a task while using controls (e.g., LEV or wet methods) relative to conducting the task without using controls are based largely on best professional judgment by OSHA's contractor. In contrast, the CISC has distributed a questionnaire and received responses from more than 75 construction industry employers and specialty trade contractors regarding, among other topics, the productivity penalties that might be associated with performing silica-generating activities consistent with Table 1 specifications. Environomics also conducted 10 interviews with knowledgeable tradespeople from CISC member organizations focusing particularly on productivity penalties. The responses suggest some respects in which OSHA's approach to productivity penalties should be rethought and estimates regarding their magnitude should be increased.

The CISC questionnaire results and our subsequent interviews convey the clear message that OSHA's productivity penalty percentages, while perhaps analytically convenient for the Agency in estimating costs, do not accurately capture actual productivity losses in most work settings. In contrast to OSHA's simple overall percentages, productivity penalties have both a fixed and variable component. The fixed component, typically involving activities such as initial set-up and final take-down and clean-up of the control equipment, often occur at the beginning and end of a job or work shift. The variable component applies to losses that occur while the control equipment is in use. OSHA's method of estimating productivity penalties, i.e., multiplying the time spent performing the silica-generating task by a productivity penalty percentage ranging from 0% to 5%, strongly suggests that the Agency has focused mainly (if not exclusively) on the variable component. The actual percentage of time represented by the fixed component will depend on the duration of the job, or the number of set-up/take-down/clean-up cycles required over the duration of the job.

When the time required for a single set-up/take-down/clean-up and the recurrence interval are both specified, this component of the productivity penalty can be regarded analytically as a second sort of variable cost that can be added to the variable cost associated with additional time required to perform the job while using the control. The CISC questionnaire respondents reported that set-up/take-down/clean-up activities typically require a significant time commitment -- on the order of 30 to 60 minutes per cycle for many of the controls under consideration. When incurred daily, a thirty-minute fixed productivity loss represents a variable productivity penalty of six percent. When incurred weekly (e.g., an average of once per week that the control equipment needs to be set up, taken down, and cleaned up after) a thirty-minute fixed productivity loss represents a variable productivity penalty of 1.2 percent. Neither of these figures includes the additional variable penalty incurred while the control equipment is in use.

Using the example of a worker such as a carpenter drilling into silica-containing materials (e.g., concrete) for anchors demonstrates what OSHA's assumptions look like in the real world.

According to OSHA, a carpenter spends an average of 4.8 minutes of his day (one percent of his time) performing this task. OSHA's estimated labor productivity penalty when performing this task using appropriate controls (LEV for the drill and a HEPA vacuum to clean up the dust) is 2 percent of the task duration, or 4.8 minutes multiplied by 2 percent, which is a little less than six seconds per day. If the carpenter is on a ten-day job, the total productivity penalty that OSHA estimates amounts to less than 60 seconds over the ten days, hardly enough time even to get the control equipment out of the truck, onto the job site and set it up once, let alone get it, set it up, use it, take it down, return it to the truck, each multiple times during the ten-day job, and also maintain the equipment from job to job. The 60 seconds clearly accounts for at most perhaps some variable component of productivity loss when operating the LEV while drilling holes.

More significantly, the worker drilling the holes may be working on a succession of one-day jobs at different sites. While his variable productivity loss if he drilled only one hole on a day could perhaps be as little as the six seconds that OSHA estimates, the fixed cost, if estimated at perhaps 15 minutes, would increases the total (fixed plus variable) daily loss from six seconds to over 15 minutes, or 150 times OSHA's productivity loss estimate.

Moreover, OSHA estimates such productivity losses only for labor, and not also for equipment. OSHA overlooks the fundamental production relationship between workers and the equipment they use in their work. That is, labor and equipment contribute together to the creation of what OSHA calls "project value". OSHA acknowledges this bedrock understanding by defining Total Daily Project Value as the sum of Daily Labor Value and Daily Equipment Value. OSHA defines Daily Labor Value as the worker's hourly wage multiplied by a standard eight-hour job shift. Similarly, Daily Equipment Value is defined by OSHA as a daily rental rate or daily fraction of an annual cost of ownership for the appropriately controlled equipment. Both labor and equipment are fully productive only when used together in a manner consistent with standard industry practice over the course of a job shift. If for any reason either labor or equipment is diverted from its usual productive use, neither contributes to project value and both experience productivity losses.

Stated differently, if due to a labor productivity loss, the labor time required to complete a job increases from eight hours to eight hours and 15 minutes, the equipment time required for job completion will also increase to eight hours and fifteen minutes. Additional equipment rental costs will be incurred for the additional fifteen minutes, or equipment owned by the employer will be delayed for use on another job by fifteen minutes. In either case the employer will have experienced a productivity loss equal to the productivity penalty multiplied by the Total Daily Project Value, not just the Daily Labor Value. OSHA's analysis should add an equipment component to the costs associated with whatever productivity penalty is incurred in performing a construction task using the Table 1 controls

While labor intensity, or the fraction of total project cost representing labor costs, varies considerably across OSHA's at-risk tasks, its average is about 58 percent. This suggests that adding an equipment productivity loss to the labor productivity loss that OSHA calculates could add costs amounting to 42/58 = 72% more to the costs that OSHA estimates for the labor productivity loss.

The following briefly describes and contrasts OSHA's and our methodological approaches.

OSHA's Approach: OSHA estimates labor productivity losses incurred when using control equipment prescribed in Table 1 of the Proposed Rule as follows:

- For each combination of at-risk task and control equipment, OSHA developed a productivity penalty, expressed as an average percentage of labor time lost due to the use of the control equipment when performing the task. These productivity penalties range from a low of zero to a high of five percent.

- OSHA multiplied these percentage productivity penalties for task and equipment combinations by corresponding project labor costs in order to calculate dollar losses (i.e., percentages of estimated total labor costs) due to the use of controls. These labor productivity losses may be interpreted as the additional labor costs incurred to complete projects when work proceeds more slowly due to use of control equipment.

Our Approach: We estimated both a fixed and a variable component to productivity losses, and we applied these losses to the total value of the tasks performed using controls, recognizing that productivity losses involve adding both worker and equipment time to what would be required to perform the tasks without the use of control equipment. More specifically:

- We assumed a fixed productivity penalty at an identical 1.25% for each task, reflecting incremental time to set-up, break down and clean up after control equipment averaging 1/2 hour at each new location where the task is to be conducted. We assumed a new task location on average every fifth work day. The fixed penalty thus adds 1/2 hour of work delay every 40 hours. (1/2)/40 = 1.25%. We assumed no fixed penalty (i.e., no additional effort for set-up and break-down) for those among OSHA's tasks where the controls are integral to the tool/machine, such as an enclosed cab when operating heavy equipment. The tasks for which we assumed no fixed productivity penalty include earth drilling, operating heavy equipment, rock crushing, and underground work.

- We estimated variable productivity penalties for each task reflecting the information we received from the CISC questionnaires and our interviews. In general, the variable penalty percentages that we estimated were the same as or slightly larger than those that OSHA had estimated. The percentages that we estimated are shown below in Table 12. Notably, the questionnaire responses and interviews indicated that something greater than

zero variable productivity penalty should be estimated for masons using portable saws controlled with wet methods (reflecting the difficulty at some sites and in the winter of accessing an appropriate water source, and significant needs for adjusting the water spray during task performance and cleaning up afterwards) and for heavy equipment operations using enclosed cabs and HEPA filters (reflecting problems with filter clogging and difficulties in communication with other workers).

- We added the fixed 1.25% and the variable percentage labor productivity penalties for each task and applied them to the total national labor value of each task that OSHA had estimated for the workers OSHA had identified as performing at-risk tasks. We calculated labor productivity losses similarly for the additional workers (e.g., plumbers) performing the additional at-risk tasks that we identified, based on the "most representative" task for each of these added occupations (see page 14). We also calculated labor productivity losses for the self-employed workers, both those in occupations that OSHA had identified as performing at-risk tasks and those in the additional occupations that we identified as also performing at-risk tasks.

- We calculated the value of equipment productivity losses to reflect the additional duration over which control equipment must be available when construction tasks take longer to complete because of labor productivity losses. We accepted OSHA's assumption that variable productivity losses are incurred only during time spent using control equipment, as measured by OSHA's estimates of time spent on at-risk tasks. OSHA aggregated its estimates of time spent on at-risk tasks to derive its overall estimate of at-risk FTEs. We therefore used OSHA's at-risk FTE estimate as our own estimate of the total amount of time that would be spent by the 3.25 million construction workers in OSHA's analysis performing at-risk tasks, and multiplied OSHA's equipment value for these tasks by the variable productivity penalty in order to estimate the equipment productivity penalty for these tasks. To estimate the equipment productivity penalty for the additional work conducted by our additional occupations and by self-employed workers, we likewise multiplied our estimate of FTE for this additional work by OSHA's estimate of equipment value per FTE for this work by the variable productivity penalty. These calculations are detailed and explained further in our cost estimation workbook.

Table 13: Estimated Variable Productivity Penalties for At-Risk Tasks

Task	Control	Fraction of Time This Control is Used for This Task	OSHA's Productivity Penalty	OSHA"s Weighted Productivity Penalty	Our Productivity Penalty Estimate
Drywallers	LEV	0.20	0.04	0.01	
	Non-silica compound	0.80	0.00	0.00	
	Total			**0.01**	**0.02**
Earth Drillers	LEV	1.00	0.00	**0.00**	**0.02**
Heavy Equipment Operators	Enclosed cab	1.00	0.00	**0.00**	**0.01**
Grinders and Tuckpointers	LEV	1.00	0.05	**0.05**	**0.05**
Hole Drillers	LEV	1.00	0.02	**0.02**	**0.02**
Impact Drillers	LEV	0.20	0.04	**0.01**	**0.02**
	Wet method	0.80	0.03	0.02	
	Total			**0.03**	**0.03**
Millers	Wet method	0.80	0.02	0.02	
	Controls in baseline	0.20	0.00	0.00	
	Total			**0.02**	**0.02**
Masons Using Portable Saws	Controls in baseline	0.67	0.00	0.00	
	Wet method	0.33	0.02	0.01	
	Total			**0.00**	**0.02**
Masons Using Stationary Saws	Wet method	1.00	0.02	**0.02**	**0.02**
Rock Crushers	Wet method	1.00	0.00	**0.00**	**0.00**
Tunnelers	Dust Suppression	1.00	0.00	**0.00**	**0.00**

E. OSHA's cost estimates for engineering controls do not reflect construction employers' inability to forecast accurately exactly which at-risk workers will be overexposed relative to a new PEL and when.

OSHA estimates the annual costs for the construction industry engineering controls needed for an at-risk task (e.g., masons operating portable saws) by: 1) identifying an appropriate set of control measures that can arguably reduce exposures to below the proposed PEL when they are used for the at-risk task; 2) estimating the cost to provide controls sufficient to protect a worker performing the at-risk task for an entire work year (i.e., for a length of time equivalent to a FTE); 3) multiplying this cost per FTE for the controls by the nationwide total number of FTE estimated to perform the task during a year; and then 4) scaling down this total national cost for engineering controls by the fraction of time that performance of the task would not have resulted in worker exposure exceeding the proposed new PEL if the task were performed without controls.[3] In essence, in this fourth step, OSHA "marks down" the engineering control cost that would be incurred to control the task every time it is performed so as to reflect controlling the task only when it would have resulted in exposure exceeding the PEL. OSHA assumes for the

[3] OSHA also further scales down the total cost that would be incurred to control the task every time it is performed, for another reason that we will discuss in our Issue #6, in the next section of this report.

Agency's cost analysis that there is no need to use controls for a task in those instances when performance of the task would not have resulted in an exposure exceeding the PEL.

While there seems on its face to be some logic to this fourth step, there is a question as to whether employers will be able accurately to distinguish the particular instances when performance of an at-risk task would result in an overexposure relative to the PEL from those instances when it would not result in an overexposure. Making this distinction would involve both identifying the particular workers involved in creating the overexposures and the particular times when the overexposures would occur.

In fact, it is extremely difficult, if not impossible, to predict accurately whether a particular construction worker performing the at-risk task on a given day at a given site will or will not be overexposed. The exposure information that OSHA has assembled shows that workers performing any of the at-risk tasks (e.g., jack hammering, tuck pointing, sawing bricks or concrete blocks, drilling into masonry, etc.) are sometimes exposed above the PEL and sometimes below the PEL depending on numerous aspects of the task and environment that are exceedingly difficult to identify, understand and predict.

For example, the silica exposure that a jackhammer operator will incur over his work shift depends importantly on such factors as how much of the shift he spends jack hammering; whether the work is performed indoors or in other confined spaces or outdoors; the silica content of the material he is breaking up; whether the wind is blowing or not; whether he stands upwind or downwind of the dust he generates; whether it is raining or not; and so on. Many of these factors are not knowable in advance, and the exact impact of these factors on the worker's exposure cannot reliably be predicted in advance. As a result, the employer is highly uncertain in advance of a jackhammer operator's work shift whether the employee is likely to be overexposed or not. The prudent employer and the prudent employee will want to use the exposure-reducing controls in all instances when the at-risk task is performed and overexposures could perhaps result if controls were not to be used. Indeed, this is the presumption inherent in OSHA's proposed Table 1 – whenever a construction worker performs a listed silica-generating task, he is expected to perform it in a manner consistent with the protective controls specified in Table 1.

Environomics recalculated OSHA's costs for engineering controls for the construction industry based upon the assumption that employers will need to adopt controls for <u>all</u> workers at all times when they perform any of the construction tasks that OSHA identifies in Table 1. This is in contrast to OSHA's costing approach – seemingly contrary to Table 1 – in which the costs the Agency estimates to do all Table 1 tasks as the Table requires is then discounted to reflect the

fraction of time that performance of the task, when assessed after the fact with perfect hindsight, would not have resulted in overexposure relative to the proposed PEL. Extending engineering controls to all workers performing at-risk tasks instead of only to the half or so, on average, that end up being overexposed relative to OSHA's exposure profile results in roughly doubling OSHA's cost estimate for engineering controls for the industry.

The following briefly describes and contrasts OSHA's and our methodological approaches.

OSHA's Approach: Under OSHA's Proposed Rule, employers must provide protective control equipment and respirators to workers engaged in dusty tasks that result in silica dust exposures over the proposed PEL of 50μg/m^3. OSHA's analysis assumes that perfect knowledge of worker exposure levels will be available to employers, allowing them to act in accordance with the Proposed Rule by providing the required protections only to the workers who would have been overexposed and only when they would have been overexposed. OSHA calculates the costs to protect all workers performing an at-risk task for all the times that task is performed, and then scales this cost down to reflect (based on the Agency's exposure profile for this at-risk task) the fraction of the times when this task is performed that it would not have resulted in an overexposure relative to the PEL.

Our Approach: We contend that employers typically will not be able to identify which workers performing an at-risk task will be exposed over the proposed PEL and when they will be overexposed. In the face of uncertainty and a requirement to act, employers will choose to err on the side of worker safety by providing control equipment and respiratory protection consistent with Table 1 to all of their workers whenever they perform an at-risk or Table 1 task. In estimating costs, we do not apply OSHA's markdown to the costs that would be necessary to protect every worker any time he or she performs a Table 1 task.

F. OSHA wrongly attempts to estimate costs and assess economic feasibility for only the incremental requirements that the Proposed Standard adds to existing requirements

OSHA has attempted to estimate and reflect in the Agency's economic impact screening analysis only the "incremental" compliance costs associated with reducing worker exposures from the current PEL of approximately 250 ug/m^3 for construction to the proposed new PEL at 50 ug/m^3. OSHA has not estimated instead the "full" compliance costs that affected industries will incur in reducing worker exposures from their current levels -- sometimes exceeding the current PELs -- to below the proposed new PEL. In our view, OSHA has made two errors in the approach it has taken:

- First, the "full" compliance costs for reducing worker exposures from their current levels to below the proposed new PEL are the conceptually correct costs to estimate when assessing economic feasibility, not the "incremental" costs for reducing exposures to below the proposed new PEL from a starting point assuming compliance with the current

PEL. In practice, employers will face the full costs, not the lesser incremental costs, and the economic feasibility assessment should consider whether employers can afford these full costs, not the hypothetical and lower incremental costs.

- Second, OSHA has made a conceptual error in the Agency's methodology for estimating compliance costs, and the costs that OSHA actually estimate fall short of even the "incremental" costs the Agency aims to estimate.

We have provided extensive comment on the "full" vs. "incremental" costs issue in both the CISC's oral testimony on March 24, 2014, and in written comments on the general industry standard that were included in the public comments the American Chemistry Council Crystalline Silica Panel has provided regarding the Proposed Standard.[4] We will now quickly summarize our earlier comments.

The following table shows the levels of respirable crystalline silica to which OSHA estimates that construction workers are now exposed.

Table 14: Number of Construction Industry FTEs Exposed at Different Levels

Group A: Exposed at > 0 ug/m^3 and < 50 ug/m^3	454,696
Group B: Exposed at ≥ 50 ug/m^3 and < 250 ug/m^3	137,770
Group C: Exposed at ≥ 250 ug/m^3	59,563
Total	*652,029*
# exposed above current PEL (Group C)	*59,563*
# exposed above proposed PEL (Groups B+C)	*197,332*

If the construction industry PEL is reduced as OSHA proposes, construction industry employers will need to implement engineering controls and respiratory protection to reduce the exposures of the 197,000 workers in groups B and C from their current levels to below the proposed PEL. We refer to these as the "full" costs of complying with the Proposed Standard.

However, the existing occupational exposure standard for crystalline silica already requires exposure reduction for the nearly 60,000 workers in group C who are exposed above the existing PEL.

OSHA aims to estimate in the PEA the incremental costs attributable to the proposed new standard, relative to a baseline in which compliance with the requirements of the existing standard is assumed already to have occurred. OSHA reasons that the current overexposures of employees in group C must be remedied when employers comply with the existing standard, and the incremental impact of the new standard will thus be to require exposure reduction only for

[4] Preliminary Letter Report of Environomics to the American Chemistry Council's Crystalline Silica Panel Regarding the Economic Impact of the Occupational Safety and Health Administration's Proposed Standard for Occupational Exposure to Respirable Crystalline Silica, submitted as Attachment 9 to the American Chemistry Council's Crystalline Silica Panel comments to the Docket on the Proposed Standard, February 11, 2014.

the 138,000 workers in group B. OSHA counts as the incremental costs of the Proposed Standard only the costs to reduce exposures for workers in group B. OSHA counts among the incremental costs of the Proposed Standard nothing for workers in group C.

We do not believe OSHA is correct in this reasoning. The proposed new standard, contrary to what OSHA has assumed, does require an incremental exposure reduction for the 60,000 employees in group C as well as for the employees in group B. The existing silica standard requires employers to reduce exposures of employees in group C only to below 250 ug/m^3. The proposed new standard requires employers to reduce exposures of employees in group C further, to below 50 ug/m^3 instead of only to below 250 ug/m^3. The incremental costs that the new standard would impose for the group C employees and that OSHA overlooks could be substantial: it will be substantially more costly, for example, to reduce the exposure of an employee who is exposed at 275 ug/m^3 all the way down to below 50 ug/m^3 than it would be to reduce his exposure only modestly, to below 250 ug/m^3.

We have been discussing the second error that OSHA makes with respect to the full vs. incremental cost issue. Insofar as OSHA omits all costs for group C employees -- failing to estimate the costs to reduce their exposures all the way down to below 50 ug/m^3 instead of only to below 250 ug/m^3 -- OSHA estimates costs that fall short of the incremental costs of the Proposed Standard that the Agency aims to estimate.

The first error that OSHA makes, in our view, is perhaps more significant. For use in assessing economic feasibility, OSHA should want to estimate the full costs of the Proposed Standard, and not only the incremental costs of the Proposed Standard relative to the existing standard. Even if OSHA had accurately defined and estimated "incremental" costs, they represent only a hypothetical compliance burden, not the real burden that employers will face. The real economic feasibility question is whether employers can afford to get all the way from where exposures are now to exposures compliant with the proposed PEL. If an affected industry cannot afford to improve from the current situation to compliance with the proposed PEL and ancillary requirements, then the proposed standard is not economically feasible for that industry. In our view, one should compare "full" compliance costs, not "incremental" compliance costs, against revenues and profits in assessing economic feasibility.

G. OSHA underestimates the costs of the ancillary provisions.

Environomics believes that OSHA has underestimated the costs of the ancillary provisions in several respects.

First, the number of construction workers to whom the provisions will apply will be higher than OSHA estimates. We estimate that more construction workers perform dusty tasks that generate silica exposures that does OSHA. We include more construction occupations as engaging in at-risk tasks than does OSHA, and for two occupations (carpenter and carpenter helper) we estimate that a higher proportion of the individuals in that occupation perform dusty tasks than does

OSHA. More individuals performing silica-generating tasks mean there will be more individuals needing respiratory protection, exposure assessment, training, medical assessment and so forth; and hence higher costs for the ancillary provisions. Note, though, that while we believe there will be strong pressures created by the Proposed Standard that will cause self-employed construction workers to perform silica-generating tasks similarly as the Proposed Standard would have regulated employers perform them, we do not expect that these pressures will cause self-employed workers also to adopt the ancillary requirements. We thus expect that self-employed workers will incur costs for engineering controls but not costs for ancillary requirements.

Second, OSHA has underestimated the unit costs for activities associated with many of the ancillary provisions in comparison to the cost experience that construction and other businesses have reported in the various industry surveys that have been conducted relating to this Proposed Rule. Third, OSHA's cost estimating methodologies do not, in some important respects, appear to match the specific requirements of the proposed regulation. For example, the requirement for reassessing workers' exposure whenever a "change in the production, process, control equipment, personnel, or work practices may reasonably be expected to result in new or additional exposures at or above the action level", when read in the context of frequently varying construction work sites and durations for performing dusty tasks, would appear to require many more exposure assessments than those for which OSHA estimates costs. Fourth, there appear to be several respects in which the ancillary provisions will require employers to perform tasks that OSHA has not included among those for which costs have been estimated, such as reading and understanding the rule and planning a compliance strategy, having an individual function as a "competent person", and several record keeping functions.

In contrast to our more comprehensive work on the costs of engineering controls, we have not had the time to simulate the manner in which we believe employers will meet all of the proposed ancillary requirements and to quantify the resulting costs in our cost estimation workbook. For engineering controls our cost estimation workbook is reasonably complete in simulating the respects in which OSHA has underestimated costs and the workbook provides more detail than this report. For the ancillary requirements, though, we provide more suggestions in this report about how OSHA should improve the Agency's cost estimates than we have been able to implement in the cost estimation workbook.

The following sections describe how we have estimated the costs for the ancillary requirements in our analysis, and suggest several additional improvements to OSHA's analysis beyond those that we have been able to implement in our workbook.

Respirators

OSHA's Approach: OSHA estimates the costs of establishing a respirator program and providing respirators as prescribed in Table 1 as follows:

- Estimate respirator unit costs that incorporate the various requirements in the Proposed Rule for respirator equipment and an employer program, and assumptions about how frequently at risk tasks are performed for less than and for more than four hours during a worker's shift. OSHA reduces the respirator unit costs by about 50 percent to reflect its estimates to the effect that at-risk tasks will be performed for more than four hours during a shift only about half the time. OSHA's unit cost estimates for the employer program are weighted by industry-level, company size distributions to capture cost differences due to employer program scale.

- Determine how many of OSHA's estimated 1.8 million workers engaged in dusty tasks need respirators. OSHA assumes that only workers exposed to silica dust at levels above the PEL will need and receive respirators from their employers.

- Adjust the estimate for workers exposed above the proposed PEL downward to reflect the Agency's estimate that 56% of the construction workers who will need respirators are already provided with them by their employers.

- Multiply the remaining workers -- i.e., those workers needing respirators under Table 1 and who are not assumed already to be using them -- by OSHA's unit cost estimates to derive a total respirator cost estimate.

Our Approach: We adopted for purposes of this analysis OSHA's respirator unit cost assumptions and estimates and focused instead on the number of workers who would be expected to receive respirators as prescribed under Table 1 of the Proposed Rule, as follows:

- We added the number of additional employees that would need respirators as a result of the additional occupations (e.g., plumbers) and additional FTE for OSHA's occupations (i.e., more FTE for carpenters and carpenter helpers) that we identified as conducting at-risk tasks and that we included in our engineering cost analysis. This resulted in adding very few additional workers, since all of the occupations and FTE that we added are among those that will not need respirators as prescribed by Table 1, except for tile and marble setters.
- We adjusted downward the reduction in cost (cost credit) that OSHA had estimated to reflect the Agency's estimate to the effect that 56% of all those workers who will need respirators are already using them. We made the following adjustments to the credit:

    - OSHA has not considered the frequency (days/yr) with which the workers who already now use respirators will need to use them after the new rule in comparison with the frequency with which they use them now. The NIOSH survey on which OSHA's respirator credit estimate is based did not address how frequently a respirator user uses one; it asked only about whether a respirator was used or not.

We assumed that workers using respirators when the survey was conducted were using them as appropriate to avoid exposures exceeding the current PEL -- whenever they would otherwise have been exposed above the current PEL. Under the Proposed Standard, these respirator users would have to use them more frequently than they did previously. We made some assumptions and reduced the credit for current usage to reflect the increased frequency with which current users will need to use respirators in the future.

- OSHA had omitted abrasive blasters from the credit calculations. We assume that all blasters are among those currently use respirators. The fraction of workers other than blasters who need respirators and currently already use them is thus only 51%,not 56% as OSHA calculated.

- We also assumed that there are more construction workers than OSHA estimates who will need respirators under the Proposed Standard , specifically those who without respirators would be exposed above the proposed new PEL while performing tasks not listed in Table 1, such as mixing cement and installing segmented concrete pavers. where they are exposed above the who were as to how manyill now have to use them more frequently; whenapproximately as often as they would have more thanNIOSH use/not use The NIOSH survey on which OSHA based the estimate that 56% of cost credit that OSHAbegan with the full 3.25 million workers in OSHA's 14 construction occupations and our additional 1.5 million workers.

As shown in detail in our cost estimation workbook, we estimate respirator costs as $109 million per year, about 30% higher than OSHA's estimate of $84 million per year.

Exposure Assessments

We did little work to improve on OSHA's estimated cost for exposure assessments. We thought OSHA's cost estimate for exposure assessment to be conservative, in the sense that OSHA estimates costs for exposure assessment for many workers despite the Agency's assumption in calculating control costs that all at-risk tasks will be performed consistent with Table 1, and this could exempt employers from exposure assessment for the workers performing these tasks. In estimating exposure assessment costs, we simply divided OSHA's estimate of exposure assessment costs by the number of construction workers that OSHA had estimated perform at-risk tasks and are exposed above the proposed PEL in order to obtain an estimate for the cost per at-risk worker who needs continuing exposure assessments. We then multiplied this cost per worker by our much larger estimate for the number of workers who perform at-risk tasks (e.g., plumbers, more carpenters) and are exposed above the proposed PEL. As detailed in our cost

estimation workbook, we estimate exposure assessment costs as $133 million per year, approximately triple OSHA's estimate of $45 million per year.

We suggest that OSHA consider developing a more accurate estimate of exposure assessment costs if employers do not subscribe to the Table 1 prescriptions when at-risk tasks are performed. In a more accurate assessment, OSHA should:

- Add costs for much more frequent exposure assessments, as would seem to be necessitated by the proposed requirement to reassess workers' exposure whenever a "change in the production, process, control equipment, personnel, or work practices may reasonably be expected to result in new or additional exposures at or above the action level". Many construction employers perform work at a wide range of varying sites that involve frequent large changes in the factors that determine what an employee's exposure will be when performing a particular task.

- Add costs as necessary to reflect tasks that the employer must conduct in connection with exposure assessments that OSHA has omitted. These tasks include: developing an exposure assessment strategy, determining which employees are to be monitored and when, identifying candidate industrial hygienists to conduct exposure monitoring, contracting with industrial hygienists to conduct the monitoring, orienting the industrial hygienist when he arrives on site, explaining the monitoring to the employees, supervising the monitoring (often involving accompanying the hygienist during the monitoring), debriefing the industrial hygienist following the monitoring, and receiving and processing the monitoring results. Several knowledgeable individuals have suggested to us that the amount of managerial time required to perform these functions, particularly for a small business employer who rarely conducts exposure monitoring, exceeds the amount of time spent by the industrial hygienist in conducting the monitoring.

- Assume unit costs for silica exposure monitoring similar to those reported in a large recent survey conducted by the concrete products industry (180 facility responses):

    - Cost/visit for silica monitoring by an IH, including total IH fees + test costs (36 responses) $3,000 median, $3,883 average
    - Typical number of employees sampled during the IH visit (75 responses): 5 median, 7.1 average
    - Cost per employee for IH sampling, including all fees plus tests: (27 responses that indicated both the number of employees sampled and total cost, thus enabling calculation of cost/employee) $444 median, $546 average.

Medical Surveillance

OSHA's cost estimate for medical surveillance is so complex that we did not adjust it other than by calculating the cost per at-risk worker and multiplying this cost by the larger number of at-risk workers that we estimated -- this approach is similar to what we did for exposure assessment. Again we estimated many more workers than did OSHA, and we ultimately estimated costs about 2 ½ times what OSHA had estimated.

OSHA should consider reflecting in the Agency's cost analysis the higher unit costs for relevant medical procedures and services that construction employers indicated that they have recently paid, in response to the CISC questionnaire (75 responses):

- Median cost for initial medical/physical exam $150/person
- Median cost for periodic medical/physical checkup $100/person
- Median cost to add chest x-ray (not including b-reader) $150/person
- Median cost to add pulmonary function test in medical/physical exam $60/person.

Training and Regulated Areas

We used the same approach again for these final two ancillary requirements, multiplying OSHA's estimated cost per worker by our larger number of workers.

Other Program Costs

Construction employers have suggested to us that they will bear substantial additional costs as a result of the Proposed Standard that OSHA has not considered, including additional compliance planning and record-keeping costs, costs to read and understand the standard, and costs to have someone perform the functions of a "competent person", which will be necessary for compliance even though a competent person is not explicitly required.

H. OSHA should correct several additional mathematical or methodological errors in the Agency's cost analysis.

In this section, we quickly discuss several additional errors in the Agency's cost analysis that OSHA should correct. In our cost estimation workbook that we have provided to OSHA, we identify these errors in more detail and suggest how to correct them. We will only quickly summarize these items here.

A first issue involves OSHA switching part of the way through the cost analysis from estimating construction worker wage rates based on RS Means estimates to estimating them based on Bureau of Labor Statistics (BLS) data. We discussed this issue extensively in our March 24 testimony.

The RS Means wage rate estimates are much higher than those provided by BLS. The RS Means rates represent those for union workers, and include benefits, overhead costs and general contractor profit. The BLS rates are intended as average rates across all workers in the occupation/industry at issue, including benefits, but not including overhead and profit.

At an early point in the Agency's cost analysis, OSHA uses the relatively high RS Means wage rates to estimate the share of costs attributable to the controls when conducting a task using controls that minimize silica exposures. For the "hole drilling" task, for example, OSHA estimates the cost for controls including the "dust shroud vacuum system" as comprising 0.988% of total job cost when using the relatively high RS Means wage rates. If the lower BLS rates had been used, wages would amount to a lower fraction of total job costs, and the fraction of total job costs attributable to the controls would be about 1.2% (more than 20% higher) rather than 0.988% as based on RS Means wage rates. Later in the analysis, OSHA estimates the total value of the nationwide volume of hole drilling that occurs, but does this by applying the BLS wage rates to the total amount of construction worker FTE that OSHA estimates are used in drilling holes. OSHA then estimates the cost of controls applied in this total national amount of hole drilling by applying the 0.988% figure to the estimated total national value that was derived using the BLS wage rates. OSHA should instead use the 1.2% figure that would reflect the share of total project costs if project costs were to be calculated using the BLS wage rates.

In our cost estimation workbook, we show how OSHA should correct its calculations for hole drilling to remedy this error, but we do not show the parallel changes that would be needed in OSHA's calculations if this error involving wage rates were to be fixed for the remainder of the at-risk tasks in addition to hole drilling. The compliance costs that OSHA estimates should increase modestly to reflect this correction, we guess by roughly 5 - 10 %. The more than 20% increase in estimated costs for hole drilling will likely be larger than the percentage increases for the other tasks.

A second error in OSHA's calculations is discussed in the tabs in our cost estimation workbook titled "X1 - Fix OSHA Errors in Cost %s". These errors occur when OSHA combines cost estimates for multiple RS Means jobs that are all considered representative of a single at-risk task. OSHA makes errors for some tasks in taking simple averages across the component jobs instead of weighted averages and other errors that seem to involve incorrect cell references in OSHA's cost spreadsheets. OSHA further needs to fix a conceptual issue as to whether the percentage figures assigned to the various jobs representing a task specify the relative frequency with which the different jobs are conducted or the relative total economic value of the different jobs that are conducted. We believe that we made appropriate corrections to fix these errors in our cost estimates shown in the workbook. Some of these errors have a substantial impact on the estimated cost of engineering controls for particular at-risk tasks.

A third set of what appear perhaps to be errors in OSHA's calculations involves estimating the number of construction workers in various occupations in each of the 4-digit construction

industries who perform at-risk tasks. OSHA's documentation for this step is incomplete in the PEA. Further explanatory notes appear in OSHA's spreadsheets that underlie the PEA calculations and that are included in the docket, but there are some differences between the various spreadsheets and it is not clear to us which spreadsheet is the most recent one that supports the final estimates in the PEA. There appear to be a series of relatively minor issues that involve: a) whether OSHA did or did not increase the estimated count of workers in each at-risk occupation/industry combination to 50 when initial calculations suggested there were fewer than 50 such workers; b) mismatches between the percentage of time that members of an occupation are assumed to spend in performing an at-risk task as shown in the PEA and as shown in the underlying spreadsheets; and c) uncertainty about whether the estimated total number of State and local employees performing at-risk construction tasks has or has not been reduced as intended to reflect State plan States.

In estimating the maintenance and operating costs per day for engineering controls, OSHA in the Agency's cost spreadsheets divides the average annualized cost for the control by an assumed 250 days of use per year. We question whether this is inconsistent with the OSHA's statement in the PEA to the effect that the Agency has decided as a result of SBREFA Panel comments to assume that control equipment will be used only 150 days per year (see page V-169 of the PEA). This inconsistency may represent an error or there may be some reasonable explanation for it. See tab X2B - "Hole Drilling Unit Costs" in our workbook for some discussion on this issue.

III. Screening Analysis to Assess the Economic Feasibility of the Proposed Standard.

OSHA's initial step in judging the economic feasibility of a proposed occupational exposure standard for an industry is to conduct a screening analysis that asks whether the projected compliance costs for the standard exceeds either 1% of the affected industry's revenues or 10% of the industry's profits. If costs are less than these thresholds the proposed regulation is presumed to be economically feasible. If costs exceed either of these thresholds there is some indication of possible economic infeasibility, and OSHA will perform further, more detailed analysis.

In OSHA's economic impact screening analysis presented in the Agency's Preliminary Economic Analysis (PEA), the Agency finds that the Proposed Standard will impose costs that are less than the 1% and 10% thresholds for every affected construction industry, and OSHA concludes therefore that the regulation is economically feasible for all construction industries. We believe this analysis is substantially flawed. In our view, OSHA has made significant errors at each step in comparing costs against revenues and profits for these industries -- in estimating compliance costs, and in estimating the typical levels of construction industry revenues and profits against which costs are compared. In this section of the report we develop an alternative screening analysis, comparing the costs that we estimate the Proposed Standard will entail for

each affected construction industry against better estimates than OSHA has developed for revenues and profits for these industries. From our screening analysis, we draw the opposite conclusion from OSHA's -- we find that the Proposed Standard is not economically feasible for at least 8 of the 10 construction industries that OSHA has defined.

We will discuss each of the three quantities that are combined in the economic feasibility screening analysis: the costs the affected construction industries will incur as a result of the Proposed Standard, their revenues, and their profits. We will present our estimates for each of these quantities, which we believe to be better than OSHA's estimates, and we will then provide the results of our screening analysis using our estimates for these quantities.

A. Costs of the proposed standard for the construction industry.

As we have discussed, OSHA has grossly underestimated the costs that construction industries will incur to comply with the Proposed Standard. The major reasons for OSHA's underestimate include:

- OSHA fails to include in the cost analysis at least nine additional construction occupations, representing a further 1.26 million workers, who routinely perform tasks that generate significant quantities of respirable crystalline silica.

- OSHA also fails to estimate the costly impact the Proposed Standard will have on how self-employed workers perform construction work.

- OSHA estimates costs to make silica-reducing control equipment available to workers for only the exact durations during which they perform construction tasks that produce respirable silica dust. Instead, control equipment must be available far more frequently; whenever workers may need to perform tasks that could generate silica.

- OSHA underestimates the productivity penalties that occur when using the controls, including both the time to setup and take down the controls themselves and clean up after using them, and the reduced efficiency that using them will entail.

- OSHA assumes that controls will be used when performing a silica-generating task only in those instances when performing the task would have resulted in exposures exceeding the PEL. Employers, however, do not have the perfect knowledge that would be required to act in this way -- they have little ability to forecast exactly when performing the task will result in an overexposure and when it will not. It is most realistic to assume that an employer without perfect knowledge will be prudent and provide controls in all instances when a task is performed if it could perhaps lead to exposures exceeding the PEL.

- OSHA attempts to estimate costs for only the incremental requirements that the Proposed Standard adds to existing regulatory requirements. OSHA misdefines and underestimates these incremental costs. But even if OSHA had accurately defined and estimated "incremental" costs, they represent only a hypothetical compliance burden, not the real burden that employers will face. The real economic feasibility question is whether employers can afford to get all the way from where exposures are now to exposures compliant with the proposed PEL -- can they afford the "full" costs of complying with both the existing PEL and the incremental reduction from the existing PEL to the new, lower PEL?

- OSHA underestimates the costs of the ancillary provisions in several ways. Perhaps most importantly, the costs for most of the ancillary provisions depend substantially on the number of employees affected by the provision -- the number of employees needing exposure monitoring, the number needing medical surveillance, etc. OSHA underestimates these numbers because OSHA wrongly omitted many construction occupations and the workers in these occupations from the Agency's analysis.

- OSHA makes several additional mathematical and logical errors in the cost analysis.

In sum, we estimate that the cost for the construction industry to meet the requirements of the Proposed Construction Standard will be nearly $3.9 billion dollars per year, a figure nearly eight times larger than OSHA's estimate of $511 million dollars per year.

In addition, though, the Proposed General Industry Standard will also result in costs for the construction industry. Many of the to-be-regulated general industries produce materials (e.g., concrete, brick, block, tile, stone, glass) and products (e.g., plumbing fixtures, roofing shingles, cast iron pieces, porcelain enameled electrical parts, insulation, paint) used in construction. As the Proposed General Industry Standard causes costs to rise for the regulated general industries, these industries will pass some of their cost increases on to their construction industry customers in the form of higher prices, and these additional costs will have a further effect on construction industries that must be evaluated in the economic feasibility assessment also.

We estimate these "pass-through" costs -- costs due to the Proposed Standard that are passed through from regulated general industries to the construction industry as a customer -- at about $760 million per year. The pass-through costs represent an additional 20% burden that the construction industry will bear as a result of the Proposed Standard beyond the $3.9 billion in direct compliance costs.

We estimate the pass-through costs in five steps, as follows:

1. We begin with the cost estimates for most of the affected general industry sectors to comply with the Proposed General Industry Standard that URS Corporation developed for the American Chemistry Council Crystalline Silica Panel.[5] URS developed compliance cost estimates for the 19 of 25 general industry sectors for which URS believed that OSHA had provided credible estimates for the number of establishments in the sector. URS estimated compliance costs of $6.13 billion per year for these 19 general industry sectors, as shown in Table 15.

2. We assumed that half (50%) of these compliance costs would be passed through to customers in the form of price increases for the products and services produced by the affected general industries.[6] We then estimated the percentage by which the prices for each affected general industry's products and services would increase by calculating the percentage of revenues for each industry that URS' compliance costs represented, and then reducing these percentage impacts on costs by applying our assumption that 50% of costs would be passed through in the form of price increases. These calculations are also shown in Table 15. The Table shows that, given our 50% cost pass-through assumption, the estimated price increases for these industries' product and service outputs would range from near zero for the asphalt paving products industry to nearly 9.5% for the pottery industry. The weighted average price increase across all 19 general industry sectors is estimated at 2.2%.

3. We then estimated how important the outputs of each of the 19 general industry sectors are as inputs for the construction industry. More specifically, we estimated for the construction industry the amount spent on inputs from each of the 19 general industry sectors as a fraction of the construction industry's revenues. We did this by using IMPLAN, a well-respected input-output model of the U.S. economy.[7] We ran IMPLAN to estimate the amounts by which construction industry purchases from each of the 19 general industry sectors would increase if construction industry revenues were to increase by $1 billion. We converted these amounts to percentage terms. As shown in Table 16, the general industry that provides the largest share of inputs to the construction industry

[5] See Critique of OSHA's Cost Models for the Proposed Crystalline Silica Standard and Explanation of the Modifications to Those Cost Models Made by URS Corporation, February 7, 2014. Submitted to OSHA by the American Chemistry Council Crystalline Silica Panel (the Panel) as Attachment 8 to the Panel's public comments, February 11, 2014.

[6] We have no strong rationale for this 50% assumption. We did not spend the time to simulate the supply and demand curves for each of the affected general industries as would be necessary to estimate the changes in equilibrium price and quantity that would ensue in the markets for each industry's products as a result of the regulatory compliance costs. Our 50% assumption is simply mid-way between the two extreme possibilities of no cost pass-through and 100% cost pass-through.

[7] For a description of IMPLAN and a discussion of its characteristics relative to other input-output models, see: Post-Hearing Brief of Stuart L. Sessions, Submitted to Docket No. OSHA-2010-0034. August 18, 2014.

is Ready-Mix Concrete. IMPLAN showed that that if construction industry revenues were to increase by $1 billion, then purchases by the construction industry from the Ready-Mix Concrete industry would increase by $21 million. Or, said another way, the value of the inputs the construction industry obtains from the Ready-Mix Concrete industry amounts to 2.1% of construction industry revenues.

4. We then estimated the increase in construction industry costs due to the price increases from each of the general industries. For each general industry, we multiplied the percentage price increase the industry's outputs would incur as a result of the Proposed General Industry Standard (from step #2) and multiplied it by the percentage of construction industry revenues represented by the outputs from that general industry (from step #3). For Ready-Mix Concrete, for example, in step #2 we estimated that product prices would increase by 0.7% as a result of compliance with the Proposed General Industry Standard. If products from the Ready-Mix Concrete industry that are used by the construction industry then amount to 2.1% of construction industry revenues, the 0.7% increase in Ready-Mix Concrete prices would result in increased costs to the construction industry amounting to 0.0147% of construction industry revenues (2.1% x 0.7% = .00147). We show these calculations in Table 16.

5. To estimate the total impact on construction industry costs from the price increases across all of the 19 general industry sectors, we simply add the estimated impacts from each of the sectors. The result is an estimate that the price increases resulting from the Proposed General Industry Standard that will be passed through as increased costs to the construction industry will amount to 0.0703% of construction industry revenues. This result is shown as the total at the bottom of column 6 in Table 16.

Table 15: Calculating the Increases in General Industry Output Prices Due to the Proposed General Industry Standard

General Industry Sector	1. Estimated Annual Compliance Costs (URS)	2. Annual Revenues (OSHA)	3. Compliance Costs (URS) as a % of OSHA Revenues (1 ÷ 2)	4.Estimated Percentage Price Increase for Industry Output* (50% of 3)
Asphalt Paving Products	$ 4,008,427	$ 9,470,196,512	0.04%	0.02%
Asphalt Roofing Materials	$ 180,630,531	$ 7,620,129,845	2.37%	1.19%
Concrete Products	$ 920,607,823	$ 22,177,440,849	4.15%	2.08%
Costume Jewelry	$ 2,257,117	$ 798,507,908	0.28%	0.14%
Cut Stone	$ 163,822,634	$ 3,728,122,309	4.39%	2.20%
Fine Jewelry	$ 19,930,151	$ 7,541,504,828	0.26%	0.13%
Flat Glass	$ 21,026,893	$ 3,637,200,414	0.58%	0.29%
Iron Foundries	$ 1,322,820,638	$ 10,367,425,350	12.76%	6.38%
Mineral Processing	$ 128,593,832	$ 2,344,857,302	5.48%	2.74%
Mineral Wool	$ 86,643,151	$ 6,095,416,156	1.42%	0.71%
Nonferrous Sand Casting Foundries	$ 515,620,777	$ 2,857,275,309	18.05%	9.02%
Non-Sand Casting Foundries	$ 799,794,670	$ 5,086,936,203	15.72%	7.86%
Other Ferrous Sand Casting Foundries	$ 416,113,102	$ 3,869,746,880	10.75%	5.38%
Other Glass Products	$ 57,584,479	$ 8,250,181,443	0.70%	0.35%
Paint and Coatings	$ 27,651,944	$ 8,544,188,637	0.32%	0.16%
Pottery	$ 522,980,143	$ 2,761,108,097	18.94%	9.47%
Ready-Mix Concrete	$ 413,044,815	$ 29,662,382,813	1.39%	0.70%
Refractories	$ 75,114,000	$ 2,561,000,461	2.93%	1.47%
Structural Clay	$ 452,835,685	$ 3,869,962,271	11.70%	5.85%
TOTAL or WEIGHTED AVERAGE	**$6,131,080,812**	**$141,243,583,589**	**4.34%**	**2.17%**

* Assuming 50% of General Industry compliance costs are passed through to customers in the form of increased product prices

Table 16: Calculating the Impact of Increased General Industry Output Prices on Construction Industry Costs

General Industry Sector	4.Estimated Percentage Price Increase for Industry Output* (50% of 3)	5. Value of General Industry Sector Outputs Used in Construction Industry, as % of Construction Revenues**	6. Increase in Construction Industry Costs as Share of Construction Industry Revenues (4 x 5)
Asphalt Paving Products	0.02%	0.99%	0.0002%
Asphalt Roofing Materials	1.19%	0.46%	0.0054%
Concrete Products	2.08%	0.64%	0.0133%
Costume Jewelry	0.14%	0.00%	0.0000%
Cut Stone	2.20%	0.10%	0.0022%
Fine Jewelry	0.13%	0.00%	0.0000%
Flat Glass	0.29%	0.06%	0.0002%
Iron Foundries	6.38%	0.11%	0.0068%
Mineral Processing	2.74%	0.18%	0.0050%
Mineral Wool	0.71%	0.33%	0.0024%
Nonferrous Sand Casting Foundries	9.02%	0.02%	0.0017%
Non-Sand Casting Foundries	7.86%	0.03%	0.0026%
Other Ferrous Sand Casting Foundries	5.38%	0.02%	0.0013%
Other Glass Products	0.35%	0.01%	0.0000%
Paint and Coatings	0.16%	0.58%	0.0009%
Pottery	9.47%	0.03%	0.0025%
Ready-Mix Concrete	0.70%	2.10%	0.0146%
Refractories	1.47%	0.21%	0.0031%
Structural Clay	5.85%	0.14%	0.0081%
TOTAL or WEIGHTED AVERAGE	**2.17%**		**0.0703%**

* Assuming 50% of General Industry compliance costs are passed through to customers as increased product prices

** From IMPLAN model

To estimate the annual amount of the passed-through cost for each of the 10 4-digit NAICS industries (excluding State and local governments) into which OSHA has divided the construction industry, we multiply our estimate to the effect that passed-through costs amount to 0.0703% of a construction industry's revenues by the annual revenues that OSHA estimates for each of the 4-digit NAICS construction industries.[8] We thus estimate that the passed-through costs amount to nearly $761 million per year for the entire construction industry. These calculations are shown below in Table 17.

Table 17: Passed-Through Costs, Direct Compliance Costs, and Total Costs from Entire Proposed Rule

NAICS	Construction Industries	1. Revenues (OSHA)	2. Passed-Through Costs as % of Revenues	3. Cost Pass-Through from General Industry (1 x 2)	Direct Compliance Costs	Total Costs From Entire Proposed Rule
236100	Residential Building Construction	$110,816,320,771	0.0703%	$77,949,968	$507,853,958	$585,803,926
236200	Nonresidential Building Construction	$333,344,827,788	0.0703%	$234,480,071	$315,282,167	$549,762,237
237100	Utility System Construction	$104,310,360,196	0.0703%	$73,373,572	$284,265,230	$357,638,801
237200	Land Subdivision	$13,570,686,538	0.0703%	$9,545,837	$12,449,348	$21,995,185
237300	Highway, Street, and Bridge Construction	$102,743,406,028	0.0703%	$72,271,351	$223,264,333	$295,535,685
237900	Other Heavy and Civil Engineering Construction	$20,681,747,644	0.0703%	$14,547,871	$65,961,104	$80,508,976
238100	Foundation, Structure, and Building Exterior Contractors	$167,434,711,984	0.0703%	$117,776,248	$721,956,879	$839,733,127
238200	Building Equipment Contractors	$31,746,873,917	0.0703%	$22,331,258	$383,513,772	$405,845,030
238300	Building Finishing Contractors	$107,157,145,199	0.0703%	$75,376,046	$490,644,056	$566,020,102
238900	Other Specialty Trade Contractors	$89,487,634,322	0.0703%	$62,947,030	$705,527,401	$768,474,431
999000	State and Local Governments	N/A	0.0703%	N/A	$181,187,235	N/A
	Total	$1,081,293,714,387		$760,599,251	$3,891,905,483	$4,652,504,734

We use the figures in the final column as the regulatory costs that we will compare against industry revenues and profits in the economic feasibility screening assessment.

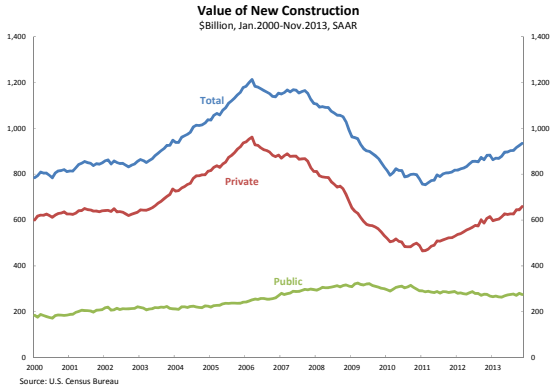
[8] We would prefer not to estimate an identical pass-through percentage for each 4-digit construction industry and for the entire industry as a whole. In fact, the actual pass-through percentages probably differ across the various construction industries as a function of the different mixes of inputs from the general industries that each construction industry uses. We guess, for example, that Land Subdivision obtains a small portion of its inputs from Ready-Mix Concrete, while Foundation, Structure and Building Exterior Contractors obtains a sizable portion of its inputs from Ready-Mix Concrete. However, we were unable to obtain information on how the input mix from different general industries differs across OSHA's construction industries because we were unable to crosswalk the subindustries into which OSHA had divided the construction industry against the subindustries into which IMPLAN had divided the construction industry. OSHA has divided the construction industry into 4-digit subindustries. IMPLAN has divided the construction industry in an entirely different manner, distinguishing construction sectors by new construction vs. maintenance and repair construction and including sectors such as construction of commercial and healthcare structures. In effect, we could use IMPLAN to provide us with information on the input mix for construction as a whole, but not with information on the mix for any of OSHA's 4-digit NAICS construction industries.

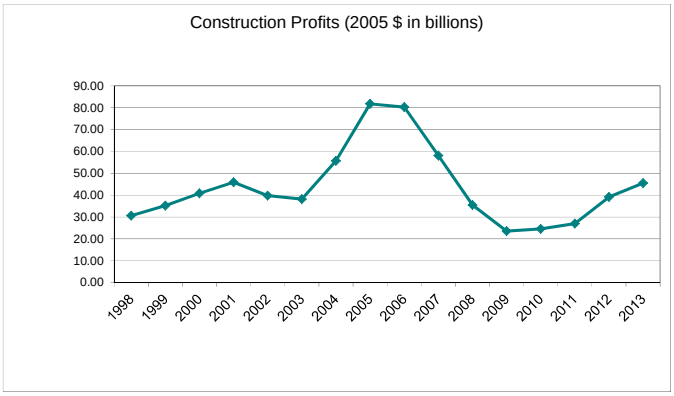
B. Revenues and profits for the construction industries.

In OSHA's economic feasibility screening assessment, the Agency compares estimated annual compliance costs for each industry against annual revenues and profits for those industries. In estimating annual revenues and profits for each industry, OSHA selects:

- Revenue data for the year 2006; and
- Profits data as the average across the years from 2000 through 2006.

We believe that it is not appropriate for OSHA to select data from 2006 and earlier to represent construction industries' ability to bear compliance costs from the proposed standard. Data from this period are quite old, and they represent neither these industries' current revenues and profits, nor their typical revenues and profits over the long term, nor their likely revenues and profits during the period when compliance with the Proposed Standard is expected. The data that OSHA has chosen do not reflect the impact of the recession, the housing slump, and the continuing construction downturn. The years 2000 through 2006 were an exceptionally good period economically for the construction industry. 2006 was a close to a peak year for both construction revenues and profits. The following graphs show construction industry revenues[9] and profits in real dollars for the past 15 years or so.





OSHA should select a more recent set of years with which to represent typical construction industry revenues and profits than those the Agency has chosen. We suggest perhaps choosing to represent typical annual revenues and profits with the average across the years from 2000 through as close to the present as possible. On this basis, average annual construction industry revenues in constant dollars over the period from 2000 through 2013 would be about 81% of revenues during OSHA's chosen year of 2006. Construction industry revenues in the year 2012,

[9] We use the value of new construction put in place as the closest we can come to total construction industry revenues.

if this proves to be the only recent year for which OSHA can obtain reliable revenue estimates for the 4-digit NAICS construction industries, were about 66% of industry revenues in 2006. Average annual construction industry pretax profits in constant dollars over the period from 2000 through 2013 are only about 57% of average annual pretax profits over OSHA's chosen period from 2000 through 2006. OSHA's choice of time periods with which to represent "typical" construction industry revenues and profits clearly results in overestimating the industry's ability to afford the costs of the Proposed Standard.

There are further significant flaws in OSHA's choice of data with which to represent revenues and profits. We provide more detail on these additional flaws elsewhere,[10] but to summarize:

- Estimates of revenues for the 4-digit NAICS construction industries are developed by the U.S. government only for years in which the Economic Census is conducted, and thus for 2002, 2007, and (when the data are released, scheduled to be later in 2014) 2012. In estimating revenues for the 4-digit construction industries for 2006, a year for which the government had developed no such estimates, OSHA estimated revenues via an indirect procedure that involved assuming that the ratio between an industry's payroll and the industry's revenues remains constant over time. This assumption is inaccurate; the ratio between an industry's payroll and its revenues has varied widely over time. We are not aware of any credible means to estimate revenues for the 4-digit construction industries for years when the Economic Census has not been conducted. In order to estimate revenues for these industries for some recent year, OSHA should await publication of the data from the 2012 Economic Census. OSHA might then combine the information from the 2002, 2007 and 2012 Economic Census with information from other data sources in order to create an annual time series of revenue estimates spanning the most recent fifteen years or so.

- OSHA chose to estimate profitability and then profits (profits = revenues x profitability) for the affected industries by using a particular data series available from the U.S. Internal Revenue Service's publication known as the *Corporation Source Book* (CSB). The CSB has a major drawback as a source of information on profitability for the affected construction industries insofar as it provides information that is aggregated in a manner that does not match OSHA's chosen 4-digit NAICS construction industries, and it provides no information at all for 5-digit or 6-digit NAICS construction industries (in contrast to other data sources that do provide information on profitability at the 5-digit or 6-digit level). OSHA's use of CSB information on the profitability of highly aggregated

[10] See the testimonies of Stuart Sessions at the OSHA Public Hearing on March 24 and March 26, 2014, and the Preliminary Letter Report of Environomics to the American Chemistry Council's Crystalline Silica Panel Regarding the Economic Impact of the Occupational Safety and Health Administration's Proposed Standard for Occupational Exposure to Respirable Crystalline Silica, submitted as Attachment 9 to the American Chemistry Council's Crystalline Silica Panel comments to the Docket on the Proposed Standard, February 11, 2014.

construction industries to represent the profitability of different, smaller construction industries that are components of these large aggregations is inadvisable. It constitutes a missed opportunity to discriminate among affected construction industries as to their differing profitabilities. And, in some instances, OSHA's attribution CSB information at a higher level of aggregation to industries defined at a lower level of aggregation likely results in a gross misrepresentation of the affected industry's profitability. Information on profitability of construction industries defined at the 4-digit and 6-digit levels is available from sources other than the CSB.[11]

A more serious problem lies in the particular data series in the CSB that OSHA has chosen to represent the profitability of an affected industry. The IRS has developed the data in the CSB by abstracting information from a stratified random sample of tax returns from corporations in each industry. OSHA chooses to draw information on profitability from the tax returns for only those corporations in each industry that were profitable (i.e., had positive profits rather than negative profits) in the year in question. This approach is quite inappropriate. The profitability of an entire industry should be estimated based on the profitability of all the businesses comprising that industry, whether they earn positive profits or negative profits. Leaving unprofitable businesses out of the calculation of industry-wide profitability is unacceptable. After all, there is nothing in the Proposed Standard that makes it applicable only to employers who have profitable businesses and that exempts unprofitable businesses. OSHA must judge the economic feasibility of the Proposed Standard with respect to the entirety of each affected industry, and OSHA must choose a measure of profitability that reflects the financial performance of all the businesses/employers in that industry, whether in any given year they make positive profits or negative profits.

There are only a limited set of improvements we can make at this time to OSHA's procedures for estimating revenues and profits for the affected construction industries that we can implement for our improved economic feasibility screening analysis for the Proposed Standard. We cannot improve OSHA's revenue estimates until the data from the 2012 Economic Census is available, so we are left with using for our improved screening analysis OSHA's incorrect and inappropriate revenue estimates for 2006 for the affected industries. We have improved on OSHA's estimates for profits by improving the procedure for estimating the profitability of the affected construction industries:

[11] In our view, the better of the other data sources includes Bizminer and RMA. However, CSB has a substantial advantage over these other data sources insofar as the CSB data derive from a stratified random sample of corporations in the subject industries, and the resulting information is therefor likely unbiased. We expect substantial biases in the Bizminer and RMA data. In the Post-Hearing Brief of Stuart L. Sessions, submitted August 18, 2014 to Docket No. OSHA-2010-0034, we provide detailed suggestions as to how OSHA can develop profitability estimates for the industries affected by the Proposed Standard that combine information from the CSB and from Bizminer or RMA in a manner that seems likely to yield estimates that are both unbiased and available at the 6-digit NAICS level.

- We estimate typical profitability for the affected industries by drawing information from the CSB and averaging it over the years from 2000 through 2011 (the most recent year available) in contrast to OSHA's period from 2000 through 2006;

- We estimate profitability by using data from CSB derived from all tax returns, both those with net income and those without. We estimate profitability as "Net Income (Less Deficit)" divided by "Receipts".

- We apply this estimate of profitability for an industry for each year from 2000 through 2011to OSHA's inappropriate estimate of 2006 revenues for that industry in order to create an estimate for profits in each year from 2000 through 2011.

- We then average the resulting annual profit estimates for the industry across these twelve years in order to estimate what we term "revised" annual profits for the industry. The following table shows OSHA's estimated profitability for each of the affected 4-digit construction industries, and our estimated "revised" profitability.[12]

[12] Note several items in this table. First, note that revised profitability as a weighted average across the 10 4-digit NAICS construction industries is a little more than half of OSHA's estimated profitability. Second, note that many of the 4-digit NAICS construction industries are estimated as having identical profitability (e.g., residential and nonresidential building construction). Different 4-digit construction industries are not likely to have identical profitability in reality; the identical estimates shown here are a function of the limited resolution of the CSB data at the 4-digit level for construction. Most construction industries are addressed in the CSB at only the 3-digit level, some are addressed at the 4-digit level, and none are addressed at the 5- or 6-digit level. Other data sources (e.g., Bizminer, RMA) do provide profitability information for all construction industries at the 4-digit level and for some at the 6-digit level. Third, note that Land Subdivision has averaged positive profitability from 2000 through 2006 (OSHA's estimates), but negative profitability over the entire period from 2000 through 2013. This industry has suffered large losses in each year since the recession and the construction downturn. Land Subdivision is the most volatile of all the 4-digit construction industries in terms of profitability. Before 2007 Land Construction averaged the highest profitability among all 4-digit construction industries, but since 2006 it has averaged the highest negative profitability among the construction industries.

Table 18: OSHA's Profitability Estimates for Construction Industries and Our "Revised" Estimates

NAICS	Construction Industries	Estimated Profitability; OSHA	Estimated Profitability, Revised*
236100	Residential Building Construction	4.87%	2.24%
236200	Nonresidential Building Construction	4.87%	2.24%
237100	Utility System Construction	5.36%	3.13%
237200	Land Subdivision	11.04%	-1.32%
237300	Highway, Street, and Bridge Construction	5.36%	3.13%
237900	Other Heavy and Civil Engineering Construction	5.36%	3.13%
238100	Foundation, Structure, and Building Exterior Contractors	4.34%	3.31%
238200	Building Equipment Contractors	4.34%	3.31%
238300	Building Finishing Contractors	4.34%	3.31%
238900	Other Specialty Trade Contractors	4.48%	3.31%
999000	State and Local Governments	N/A	N/A
	Total	4.87%	2.77%

* "Revised" profits extend the averaging period for profits from 2000 - 2006 (OSHA) to 2000 - 2011 (revised) and calculate profitability for an industry across all corporations in that industry, not only those that were profitable in the year in question (as OSHA did)

In our economic feasibility screening analysis, we will compare for each industry our estimate of the annualized total costs of the entire Proposed Standard (both direct costs and pass-through costs) against revenues (OSHA's estimated revenues for 2006 for that industry) and against "revised" profits for that industry.

We have made several additional suggestions as to how OSHA can improve the resolution of the profitability estimates by using data from additional sources (Bizminer, RMA) to supplement the data from CSB, but we have not implemented these suggestions for our economic feasibility screening analysis.[13]

C. OSHA should assess economic feasibility for the most seriously affected construction industries with these industries defined in a less aggregated manner.

In addition to making errors in estimating revenues and profits for the construction industries, OSHA conducts the entire economic feasibility screening analysis only for construction industries defined as 4-digit NAICS. Such large, aggregated industry groupings lump together construction industries that will be highly affected by the Proposed Standard with other unaffected construction industries that work minimally with silica-containing materials, thus diluting the perceived impact of the Proposed Standard.

For example, OSHA analyzes the 4-digit industry "Foundation, Structure and Building Exterior Contractors," which includes two likely substantially affected underlying 6-digit industries (masonry contractors and poured concrete contractors) for whom the impacts of the regulation

[13] See the Post-Hearing Brief of Stuart L. Sessions, submitted August 18, 2014 to Docket No. OSHA-2010-0034.

will be obscured by including also other 6-digit industries that are minimally affected (e.g., framing, glass, roofing, siding, structural steel). There is little reason why OSHA should analyze construction industries defined only at the 4-digit level. For General Industry, for example, OSHA estimates costs and analyzes impacts for many 6-digit NAICS industries. OSHA should seek to define and analyze some of the more specialized industries that perform construction work and that will likely be most seriously affected to assess whether the Proposed Standard is in fact economically feasible for them. Some possible examples might be: masonry contractors, hardscape and segmented paver installers, demolition contractors, tile roofers, poured concrete contractors, concrete sawing and drilling, and home builders. Each of these can fairly be regarded as an "industry", in the sense that each includes a large group of companies that provides a distinctive set of products and services. Each also has one or more industry trade associations.

D. Revised economic feasibility screening analysis for the construction industries affected by the proposed standard.

We will summarize the revised screening analysis that we perform to assess whether compliance with the Proposed Standard is economically feasible for the affected construction industries.

We estimate the total cost that the Proposed Standard will impose on construction industries at $4.65 billion per year, consisting of $3.9 billion/year in direct costs to comply with the standard for the construction industry and $760 million/year in additional costs passed through as general industries comply with their portion of the standard. The estimated pass-through costs add about 20% to the estimated direct costs.

Table 19 below compares these estimated total costs for the affected 4-digit construction industries against their revenues and profits. The revenues shown are those that OSHA estimated for the year 2006. Despite the inappropriate choice of the year 2006 to represent typical conditions for the construction industry and OSHA's inappropriate procedure for estimating revenues for 2006; we have not yet developed better revenue estimates. The "revised" profits shown in the table below result from multiplying OSHA's (inappropriate and likely too high) revenue estimates by our "revised" estimates for the profitabilities of the affected construction industries, with the revisions intended to correct several errors in OSHA's approach to estimating profitability. In effect, then, for our screening analysis we have been able to correct some, but not all, of OSHA's errors in estimating revenues and profits for the affected construction industries.

Despite our inability to improve this analysis so as to more fully represent the impact of the Proposed Standard on the construction sector, we find that the estimated regulatory costs will exceed OSHA's traditional revenue/profits thresholds for 8 of the 10 large, aggregated 4-digit construction industries. If we were able to improve on OSHA's inaccurate revenue estimates

and analyze impacts on construction industries that are defined more precisely to reflect the more silica-intensive construction activities, we would undoubtedly find impacts even more significant than those shown below.

Table 19: Estimated Total Costs (Direct + Pass-Through) of the Proposed Standard Exceed 10% of Profits for 8 of 10 Construction Industries

NAICS	Construction Industries	Total Costs From Entire Proposed Rule	Revenues (OSHA)	Total Profits, Revised*	Total Costs as a % of OSHA's Revenues*	Total Costs (CISC) as a % of Revised* Profits
236100	Residential Building Construction	$585,803,926	$110,816,320,771	$2,479,576,784	0.53%	23.63%
236200	Nonresidential Building Construction	$549,762,237	$333,344,827,788	$7,458,775,839	0.16%	7.37%
237100	Utility System Construction	$357,638,801	$104,310,360,196	$3,264,484,768	0.34%	10.96%
237200	Land Subdivision	$21,995,185	$13,570,686,538	-$179,185,217	0.16%	-12.28%
237300	Highway, Street, and Bridge Construction	$295,535,685	$102,743,406,028	$3,215,445,555	0.29%	9.19%
237900	Other Heavy and Civil Engineering Construction	$80,508,976	$20,681,747,644	$647,253,543	0.39%	12.44%
238100	Foundation, Structure, and Building Exterior Contractors	$839,733,127	$167,434,711,984	$5,542,651,505	0.50%	15.15%
238200	Building Equipment Contractors	$405,845,030	$31,746,873,917	$1,050,928,188	1.28%	38.62%
238300	Building Finishing Contractors	$566,020,102	$107,157,145,199	$3,547,261,527	0.53%	15.96%
238900	Other Specialty Trade Contractors	$768,474,431	$89,487,634,322	$2,958,556,459	0.86%	25.97%
999000	State and Local Governments	N/A	N/A	N/A	N/A	N/A
	Total	$4,652,504,734	$1,081,293,714,387	$29,985,748,951	0.43%	15.52%

* "Revised" profits extend the averaging period for profits from 2000 - 2006 (OSHA) to 2000 - 2011 (revised) and calculate profitability for an industry across all corporations in that industry, not only those that were profitable in the year in question (as OSHA did)

Our analysis on this basis shows that eight of the ten construction industries (defined in OSHA's aggregated manner that dilutes and reduces the calculated impact of the regulatory costs) will face compliance costs from the proposed rule that exceed the revenue/profits threshold. The proposed rule should be found to be economically infeasible on this basis.

The impacts of the Proposed Standard on construction industries' revenues and profits will be even higher than is shown here when OSHA is able to generate more appropriate (lower) estimates for construction industries' typical annual revenues. Also, costs would be found to be even farther over the revenue/profits thresholds if OSHA were to define and investigate -- as the Agency should -- the affected construction industries in a more precise manner, focusing on the 6-digit construction industries or other construction industry sectors that are most intensively involved with silica-containing construction materials.