Costs to the Construction Industry and Job Impacts from OSHA's Proposed Occupational Exposure Standards for Crystalline Silica

Report by Environomics, Inc.

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The Construction Industry Safety Coalition (CISC) estimates that OSHA's proposed silica standards will cost the construction industry in the U.S. more than $4.9 billion per year, making it potentially the most expensive OSHA regulation ever for the industry.[1]

- About 80% of this cost ($3.9 billion/year) will be direct compliance expenditures by the industry for additional equipment, labor, O&M expenses, productivity losses, monitoring, respirators, medical surveillance, record-keeping, etc.

- About 20% of this cost ($1.05 billion/year) will come in the form of increased prices that the industry will have to pay for construction materials and building products -- brick, block, stone, tile, concrete, paint, plaster, asphalt, roofing shingles, enameled plumbing fixtures, countertops, etc. -- when manufacturers of those materials pass on some of their costs of complying with the "General Industry" portion of OSHA's proposed silica standards.

The CISC estimates that the proposed regulation would reduce the number of jobs in the U.S. economy by more than 52,700. The job losses would consist of about:

- 20,800 jobs directly in construction,
- 12,180 additional jobs lost in industries that supply materials, products and services to the construction industry (e.g., manufacturers of construction equipment and materials, architects, transportation, realtors, etc., known as "indirect" jobs), and
- Nearly 20,000 further jobs lost when those who lose their jobs in construction and supplier industries no longer have earnings to spend (i.e., "induced" jobs).

These job figures are expressed on a full-time equivalent basis. Given the large number of part-time and seasonal jobs in construction, the number of actual workers and actual jobs affected will be much more than 52,700.

The remainder of this paper provides further detail and explanation for these estimates. We also provide a table that shows how the national totals for costs and job losses will be distributed among the 50 States and the District of Columbia.

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[1] At least since the Office of Management and Budget began keeping track of costs for major regulations in 1981.

Estimated Annual Costs to Construction Industries from OSHA's Proposed Silica Standards (in 2009 $/yr)

NAICS	Construction Industries	1. Net Value of Construction Work (in thousands)*	2. Estimated Net Value of Construction Work by Nonemployers (in thousands)**	3. Passed-Through Costs as % of Construction Industry Revenues***	4. Cost Pass-Through to Construction from General Industry (1 + 2) x (3)	5. Direct Compliance Costs****	Total Costs to Construction from Entire Proposed Rule (4 + 5)
236100	Residential Building Construction	$273,052,536	$26,722,612	0.0703%	$210,866,622	$507,853,958	$718,720,580
236200	Nonresidential Building Construction	$208,329,710	$2,945,186	0.0703%	$148,614,133	$315,282,167	$463,896,300
237100	Utility System Construction	$99,756,984	$350,842	0.0703%	$70,417,442	$284,265,230	$354,682,672
237200	Land Subdivision	$20,074,553	$898,245	0.0703%	$14,752,601	$12,449,348	$27,201,949
237300	Highway, Street, and Bridge Construction	$88,039,596	$354,024	0.0703%	$62,177,483	$223,264,333	$285,441,816
237900	Other Heavy and Civil Engineering Construction	$15,998,017	$1,120,233	0.0703%	$12,041,250	$65,961,104	$78,002,354
238100	Foundation, Structure, and Building Exterior Contractors	$151,584,904	$13,077,818	0.0703%	$115,826,385	$721,956,879	$837,783,264
238200	Building Equipment Contractors	$298,322,899	$12,553,644	0.0703%	$218,675,520	$383,513,772	$602,189,292
238300	Building Finishing Contractors	$116,337,448	$29,568,028	0.0703%	$102,632,240	$490,644,056	$593,276,296
238900	Other Specialty Trade Contractors	$110,098,149	$23,558,648	0.0703%	$94,016,323	$705,527,401	$799,543,724
999000	State and Local Governments	N/A	N/A	0.0703%	N/A	$181,187,235	$181,187,235
	Total	$1,381,594,795	$111,149,279		$1,050,019,999	$3,891,905,483	$4,941,925,483

* From 2007 Economic Census, updated to 2009 dollars using GDP deflator for comparability with OSHA's estimates. Includes only construction work done by firms with employees

** Estimated from 2007 Nonemployer Census data for NAICS 23, adjusted to avoid double-counting the value of work performed by subcontractors. Includes only work done by construction businesses without employees (e.g., self-employed individuals). Updated to 2009 $ using GDP deflator

*** Estimated based on: 1) Compliance costs for General Industry estimated by URS Corp. for ACC Crystalline Silica Panel, 2) Assume General Industry passes through 50% of these costs to their customers, 3) Estimate resulting percentage price increases for the products from each affected General Industry, 4) Use IMPLAN input-output model to determine the quantity of inputs the construction industry uses from each affected General Industry, 5) Compare the total passed-through costs from all affected General Industries to the construction industry against construction industry revenues.

**** See CISC Comments, August 18, 2014; report by Environomics, Inc.

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The following is an alternative, less complex version of this table.

Estimated Annual Costs to Construction Industries from OSHA's Proposed Silica Standards (in 2009 $/yr)

NAICS	Construction Industries	Costs Passed Through to Construction from General Industry	Direct Compliance Costs to Construction Industry	Total Costs to Construction from Entire Proposed Rule
236100	Residential Building Construction	$210,866,622	$507,853,958	$718,720,580
236200	Nonresidential Building Construction	$148,614,133	$315,282,167	$463,896,300
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999000	State and Local Governments	N/A	$181,187,235	$181,187,235
	Total	$1,050,019,999	$3,891,905,483	$4,941,925,483

Cost and Job Impacts of Proposed OSHA Silica Standards, by State

	Total Annual Cost to Construction Industry of Proposed Silica Standards (in million $/yr)	Direct Job Losses (construction industry only)	Additional Job Losses (suppliers to construction industry, "indirect")	Additional Job Losses (from respending by those who lose direct and indirect jobs, "induced")	Total Job Losses
Total U.S.	**$4,941.9**	**20,791**	**12,179**	**19,786**	**52,755**
Alabama	$64.0	328	188	287	802
Alaska	$18.9	58	26	41	125
Arizona	$163.3	551	225	385	1,161
Arkansas	$26.0	173	111	170	453
California	$691.2	2,324	1,457	2,275	6,056
Colorado	$112.9	479	210	334	1,023
Connecticut	$50.1	218	146	256	620
Delaware	$14.7	69	37	66	172
District of Columbia	$5.3	21	48	87	155
Florida	$315.5	1,360	718	1,247	3,325
Georgia	$159.6	683	377	588	1,648
Hawaii	$29.8	93	44	92	229
Idaho	$28.5	140	56	93	290
Illinois	$204.8	784	556	862	2,202
Indiana	$92.8	416	276	409	1,101
Iowa	$46.3	205	127	209	541
Kansas	$37.1	188	118	182	488
Kentucky	$50.5	264	162	247	673
Louisiana	$79.8	381	172	279	832
Maine	$15.6	104	47	91	242
Maryland	$125.0	499	221	367	1,087
Massachusetts	$92.5	406	293	528	1,226
Michigan	$106.7	499	397	607	1,502
Minnesota	$107.8	384	244	409	1,037
Mississippi	$32.6	184	96	159	439
Missouri	$90.2	469	237	394	1,100
Montana	$18.1	91	33	63	187
Nebraska	$24.4	125	79	128	332
Nevada	$90.3	294	103	194	592
New Hampshire	$17.5	102	54	94	250
New Jersey	$134.6	496	368	580	1,444
New Mexico	$33.2	144	62	108	315
New York	$238.5	1,007	696	1,292	2,995
North Carolina	$161.1	711	357	575	1,643
North Dakota	$11.0	52	28	48	128
Ohio	$129.8	663	477	761	1,902
Oklahoma	$38.9	225	141	216	582
Oregon	$67.5	274	158	267	698
Pennsylvania	$167.0	765	498	851	2,114
Rhode Island	$15.8	63	39	75	177
South Carolina	$66.2	309	171	270	750
South Dakota	$10.1	59	29	56	143
Tennessee	$77.4	415	248	392	1,055
Texas	$414.4	1,782	969	1,462	4,213
Utah	$60.3	233	115	173	521
Vermont	$9.2	57	25	45	127
Virginia	$146.9	635	349	516	1,500
Washington	$142.5	507	254	432	1,193
West Virginia	$16.6	90	60	99	248
Wisconsin	$75.1	354	253	388	995
Wyoming	$14.0	60	27	35	122
Total U.S.	**$4,941.9**	**20,791**	**12,179**	**19,786**	**52,755**

Further Detail on our Cost Estimates

OSHA estimates that the proposed silica standards will cost the construction industry about $511 million per year while the CISC estimates $4.94 billion per year, about 10 times OSHA's estimate.

- OSHA's estimate is developed in the Agency's *Preliminary Economic Analysis and Initial Regulatory Flexibility Analysis for the Proposed Rulemaking for Occupational Exposure to Respirable Crystalline Silica*.

- The CISC's analysis is provided in the Coalition's Post-Hearing Comments submitted to the OSHA Docket on August 18, 2014. These August, 2014, estimates have been updated recently to: 1) estimate costs and job impacts on a State-by-State basis; and 2) adjust how we calculate the costs that will be passed through to the construction industry by the General Industries also regulated by the proposed standards.[2]

OSHA's analysis in many ways reflects a fundamental misunderstanding of the construction industry. The following are some of the major errors that OSHA makes in the Agency's cost and impact analyses and reasons why the CISC's cost estimate is appropriately so much higher than OSHA's:

- OSHA has 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, asphalt) 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 customers, including the construction industry, in the form of higher prices. These price increases will represent increased costs for the construction industry.

- 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 that also work on silica-containing materials such as plumbers, electricians, roofers and plasterers. In general, OSHA estimates costs while focusing on silica exposures in heavy construction (roads, bridges, water and sewer, etc.), missing the costs that will result for many tasks and workers involved in residential and commercial construction and remodeling/renovation.

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[2] See an Excel workbook titled "Calculations for Costs and Job Losses by State" for the updates.

- 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 directly 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, silica-related tasks in a manner consistent with the specifications in the proposed rule. Regulated construction firms will then need to pay these higher costs when they use self-employed construction workers as subcontractors, which is very common.

- More generally, OSHA overlooks the prevalence of subcontracting in the construction industry. OSHA presumes that the total revenues for the construction industry for a year is equal to the summed revenues of each of the firms in the industry for that year. But this approach double-counts the portion of each firm's revenues that is paid out to that firm's subcontractors. The Census Bureau provides a much more appropriate and much lower estimate for total revenues based on "Net Value of Construction Work", which excludes the amounts that construction firms pay subcontractors in the construction industry. We use these net figures for our analysis. OSHA's approach suggests that construction industry employers have much larger revenues available for paying the compliance costs of the proposed regulation than they actually do have.

- OSHA makes the entirely impractical assumption that controls (e.g., water spray, ventilation, vacuums, etc. to suppress or capture silica dust) 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. In construction work, though, it's not possible to know in advance where, when and for how long a dusty task will be performed. In practice this means that the mandated silica-minimizing control equipment can't be whisked in an out to the exact worker, location and duration when the control will be used. Instead it will need to be available virtually always to every construction worker who might occasionally perform an at-risk task. Control equipment costs will be much, much higher than OSHA has estimated.

- OSHA further assumes in the Agency's cost analysis that control equipment, respirators, monitoring, etc. will need to be provided and used only when performing a dusty task that would result in silica exposures that exceed the proposed limit. Again, though, construction employers can't know in advance when the limit will be exceeded -- they don't know in advance what the silica content will be in the materials worked with at different work sites, they don't know how much of the worker's shift he will need to spend doing the dusty task, they don't know what the job and weather conditions will

be that affect silica levels (e.g., indoors, outdoors, confined spaces, rainy, windy), etc. Again, workers will need to use the silica control measures that OSHA mandates nearly always whenever they perform a dusty task, not in only the limited instances when after the fact they would have been found to be overexposed had they not used the measures.

- OSHA underestimates the productivity penalties that occur when using the controls, including both the time to set up and take down the controls themselves and clean up after using them, and the reduced efficiency that using them will entail. OSHA also doesn't consider the numerous circumstances in which the prescribed controls are particularly onerous, impractical and/or dangerous -- for example using water sprays to reduce silica dust when working outdoors in the winter in the north, or on a pitched roof.

- In OSHA's analysis of the impacts that the projected compliance costs will have on the industry, the Agency compares the costs against the industry's ability to bear these costs as measured by the industry's revenues and profits. We've already mentioned OSHA's error in focusing on gross revenues rather than net; OSHA badly overestimates industry revenues and profits in other ways also. OSHA wrongly uses industry data from the years 2000 through 2006 -- before the recession, before the housing slump, and among the best years ever for the industry -- to represent the industry's current ability to afford additional regulatory costs. OSHA also fails badly in the Agency's SBREFA analysis to portray the particular difficulties that the many small businesses in the industry will face in meeting the proposed standards.

These are just a few of the ways in which OSHA's estimates are inaccurate regarding the costs and impacts that the proposed silica standards will impose on the construction industry. A full discussion is provided in the CISC's Post-Hearing Comments submitted to the OSHA Docket on August 18, 2014. Further details on the breakdown of costs by State and employment estimates are available in an Excel workbook titled "Calculations for Costs and Job Losses by State."

Estimating the Number of Jobs That Will be Lost as a Result of the Regulation

We estimate the job impacts from the regulation by using a combination of our cost projections, U.S. government data and methodology, economic estimates from the published literature, and a well-respected model of the interactions between the various sectors of the economy.

We begin with our projection that OSHA's proposed regulation will cost the construction industry more than $4.9 billion per year: about $3.9 billion per year in direct compliance costs, and about $1 billion per year in price increases for construction materials by manufacturers after they comply with the General Industry portion of the silica standards. We view these additional costs as an increase in the costs of performing construction work. In economists' terms, the regulatory costs represent a backward shift in the "supply curve" for construction. Because of these increased costs, at any given price for construction work the industry will be able to perform less work after the regulation than it was able to perform before the regulation.

The U.S. Environmental Protection Agency (EPA) has a methodology they commonly use to predict the market impact when a regulation causes such an increase in the cost of supplying any goods or services. We adopt the EPA's approach. We draw estimates from the published literature regarding the "price elasticities" of demand and supply for construction work,[3] and then estimate the degree to which the added regulatory costs will cause a backward shift in the supply curve and a reduction in the quantity of construction work that will be performed. We estimate on this basis that the costs of the silica rule will cause a market shift resulting in about 0.22% less construction work being performed each year.

We then run this projected reduction in construction output through IMPLAN®, a widely respected input-output model of the U.S. economy, to estimate the effect on employment from the reduced construction activity. IMPLAN® projects that there will be three sorts of employment impacts:

1. The loss of 20,791 "direct" jobs in the construction industry.[4] As the construction industry performs less work, the industry will use fewer workers, both fewer workers employed by construction firms, and fewer self-employed construction workers.

2. The loss also of 12,179 "indirect" jobs among suppliers to the construction industry. As less construction work is performed, fewer workers in other industries are needed to provide the products, materials and services that the construction industry uses -- fewer workers at concrete plants, fewer architects, fewer truck drivers to deliver construction supplies, etc. IMPLAN® has carefully modeled the relationships throughout the

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[3] Based on the literature, we assume a price elasticity of demand for construction of -0.8 and a price elasticity of supply for construction of 4.0. Our estimates for the costs to the construction industry and job losses are affected by these assumptions. We believe these assumptions are conservative, in the sense that we believe there is more support in the literature for choosing alternate values that would increase the estimated costs and job losses than there is for choosing alternate values that would reduce the estimated costs and job losses.

[4] The model accounts for workers or jobs as full-time equivalents. The 20,791 direct "jobs" that will be lost represent 20,791 person-years of employment. Given the frequency of part-time or seasonal employment in the construction industry, there are likely many more than 20,791 workers who will lose their jobs and many more than 20,791 jobs that will disappear.

economy between every industry and its suppliers and customers. The model can thus estimate the numbers of workers that will become unnecessary if 0.22% less construction work is performed each year, and the industries in which these jobs will be lost.

3. The loss also of 19,786 jobs among a wide range of industries that would have provided goods and services to the individuals in the 20,791 direct and 12,179 indirect jobs that will be lost in the construction industry and its suppliers. These second-order job losses are known as "induced" losses. The individuals in the nearly 33,000 direct and indirect jobs that are lost would have spent their earnings on food, entertainment, housing, education, travel, and many more items that would have supported nearly 20,000 additional workers.   IMPLAN® models these linkages also.

In total, IMPLAN® projects that the 0.22% reduction in construction work that will be performed each year due to the proposed regulation will cause a loss of 52,755 jobs.   Since the regulatory costs will occur every year in the future, the 52,755 fewer work-years that will be needed each year becomes, in effect, a permanent loss of 52,755 full-time equivalent jobs.

Estimating How the Regulatory Costs and Job Losses Will be Distributed Among the States

We use data from the Federal government in estimating how much of the costs and job losses will occur in each State.

CISC has estimated the costs to the construction industry from the proposed regulation on a national basis for each of the 10 4-digit construction NAICS code industries (and for an 11th "industry", State and local government, that also performs construction work). We then distribute the estimated national compliance cost for a 4-digit industry among the States in proportion to the fraction of "Net Value of Construction Work" that is performed in each State.[5] Thus, for example, since Alabama accounts for 1.23% of total national Net Value of Construction Work for NAICS 2361, Residential Building Construction, we then assign to Alabama 1.23% of the total national compliance cost estimated for NAICS 2361.

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[5] We obtained data on Net Value of Construction Work by State and by 4-digit construction NAICS industry from the 2007 Economic Census. OSHA made several mistakes in attempting to obtain parallel data on construction industry revenues. OSHA made a bad decision in choosing 2006 as the base year for analysis. The Economic Census is conducted only every five years (2002, 2007, 2012) and not in 2006. In the absence of Economic Census information for the Agency's chosen base year of 2006, OSHA made serious errors in estimating what various quantities might have been in 2006. OSHA also represented construction industry revenues by using gross figures that double-count the extensive subcontracting that occurs in the industry rather than using net figures, thus greatly overestimating the revenues the industry has available with which to pay the regulatory costs. We use revenue figures that are net of subcontracting.

We distribute the total national estimated direct job losses (which occur in the construction industry only) among the individual States by: i) dividing each State's projected loss in construction revenues by each State's average revenue per construction employee, and then ii) adjusting slightly so that the national total direct job loss estimated in this manner equals the national total direct job loss estimated by IMPLAN®.

We distribute the total national indirect and induced job losses among the individual States in a similar manner. IMPLAN® provides national estimates for indirect and induced job losses from the proposed regulation on an industry-by-industry basis. For induced job losses, for example, IMPLAN® projects that 1,368 of the 19,786 induced job losses will occur in the "Finance and Insurance" industry. We distribute these 1,368 job losses in Finance and Insurance among the States in the same proportion as employment in Finance and Insurance is distributed among the States. For example again, Alabama has 1.09% of the nation's jobs in Finance and Insurance, and we thus assigned it 1.09% of the total national job losses expected in Finance and Insurance.