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Construction

Development of an ACGIH Construction Industry Silica Exposure Database Overview

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Silica dust exposures are greater in construction than in any other American industry. Air samples taken at construction sites in 1995 and 1996 exceeded the permissible exposure limit (PEL) 37 percent of the time, with exposures over the PEL much more frequently for construction (29.9%) than any other industry including metal mining (1.2%), foundries (2.2%), and coal mining (0.8%).[1] Although some studies have reported exposure ranges for activities including Blutte on sawing and grinding in highway construction,[2] Chisholm on concrete and masonry work,[3] and Lofgren on a variety of tasks,[4] information for many other construction activities is unavailable.

OSHA is currently developing a new regulation for silica exposure,[5] and has sought specific information on silica exposures in the construction industry.[6] Contractors, safety technicians, and professionals frequently lack data on which to base exposure and risk assessment because regular air sampling is rarely conducted in the construction industry. Information on exposure levels is needed to predict future exposures, to evaluate the efficacy and need for controls, and to determine appropriate respiratory protection as required by OSHA's Respiratory Protection Regulation.[7]

The fact that no comprehensive source of exposure data exists does not indicate that air monitoring on construction sites is not being conducted. Both private parties (contractors, consultants, and insurance carriers), and public entities (regulators and research institutions) are certainly evaluating the hazard. However, much of this data is not available publicly, nor is it organized in a manner that would assist the construction community in predicting and controlling exposures to workers. There is increasing recognition of the need to compile data and utilize it more effectively within the occupational health community.[8,9]

Silica Data Project—ACGIH Construction Committee

The Construction Safety Council has published two excellent silica hazard guides for employers[10] and workers.[11] However, the construction community does not have access to guides or materials that estimate silica exposures for workers carrying out specific work activities or tasks. The ACGIH Construction Committee has undertaken a project to create such a guide. As a first step to estimating silica exposures, the committee is endeavoring to gather exposure data from public and private sources to create statistical estimates of exposure by job, activity, and other categories. This database and accompanying exposure estimates will be available on a website that will ultimately be hosted by ACGIH.

A spreadsheet/database template has been developed for collection of exposure data. It has been recognized that organizing the analysis and estimation of construction worker exposures by task can be a powerful and useful grouping strategy.[12,13] This method has also been successfully applied to estimating silica exposures in construction.[14] The committee has developed a template that includes categories for project type, project purpose, trade/job, task, tool, controls, ventilation, nearby dust generation, and environment (degree of enclosure) to accommodate the variety of grouping schemes employed by working hygienists. For each of the grouping categories, the committee has developed pull-down menus of specific choices. For example, for trade/job, the data template offers the following choices: finish mason, stone mason, laborer, heavy equipment operator, carpenter, painter, other, and don't know. See Figure 1 for a condensed version of the database template. The actual database template includes data fields to address data identifiers (date, state, country, SIC code) and sampling information (sampler type, flow rate, silica analysis method, and sampled minutes).

The committee recognizes that most silica sampling data will not include all of the variables appearing in the template. However, the template was constructed to be comprehensive in order to accommodate a variety of data collection strategies that may be used in the field. In addition to a template for collection of individual samples, the committee has created a shortened version of the template for collection of data that has been published or otherwise aggregated

Data Source	Project Code	Study Type*	Month/Yr	State	Country	Proj.Type*	Proj.Purpose*	SIC Code	Trade/Job*	Task	Tool	Tool Make/Model	Controls*	General Ventilation*	Nearby Dust Generation	PBZ or Area	Environment*	Sampler*	Flow Rate (lpm)	Silica Analysis Method*	Sampled Minutes	Quartz (mg/m3)	Cristob. (mg/m3)	Dust (mg/m3)	%Silica	Calc.PEL or PEL used

***Drop down menus:**

StudyType:	Proj.Type:	Proj. Purpose:	Trade/Job:	Task:	Tool:	Controls:	General Ventilation:	Nearby Dust:	Environment:	Sampler:	Method:
worst case sample	residential	new	finish mason	abrasive/sand blast	abrasive blast	None	None	Usually	Open air	nylon cyclone	IR
random sample	highway	renovation	stone mason	non-power hand demo	sledge	Water on tool	Natural	Sometimes	Partially enclosed	alum. cyclone	FTIR
convience sample	indust/comm ercial	demolition	laborer	power hand demo	crow bar	Water by helper	Cooling fans	Rarely/never	Enclosed	37mm cassette	XRD
intervention study	other_____	maintenance	heavy equip oper	heavy equip demo	chipping gun	Wetting in advance	Mechanical(dilution)	don't know	Confined space	IOM	Colorimetric
controlled field study	don't know	other_____	carpenter	road demo	jackhammer	Shroud on tool	don't know		don't know	direct reading_	other_____
other_____		don't know	painter	cut tunnel	bobcat	Hood				other_____	don't know
			other_____	rock drill	machine-mounted hammer/chipper	Neg. press. enclos.				don't know	
			don't know	rock crush	machine-mounted shear	Isolation					
				surface grind	wrecking ball	Delayed re-entry					
				tuckpoint grind	road mill	other_____					
				floor sanding	vermeer saw	don't know					
				cut concrete slab	backhoe/excav/bull dosier						
				cut block	grader						
				cut brick	rock crusher						
				cut asphalt	core drill						
				clean up	rock/concrete drill						
				mix concrete	lateral (dowel)drill						
				other_____	surface grinder						
				don't know	right angle grinder						
					floor sander						
					walk-behind concrete saw						
					hand-held concrete saw						
					wall saw						
					stationary masonry saw						
					hand-held power saw						
					broom/shovel						
					compressed air						
					leaf blower						
					concrete mixer						
					other_____						
					don't know						

FIGURE 1
Silica data base template, condensed version.

into summary statistics (such as means, ranges, standard deviations, etc.).

Data Collection and Dissemination

Data can be submitted to the construction silica database in several ways. The data template can be downloaded from a West Virginia University Safety and Health Extension web page (http://www.wvu.edu/%7Eexten/depts/she/silica.htm) as either an Excel spreadsheet or an Access database. Data can be sent to West Virginia University as either hard or electronic copy for data entry.

The confidentiality of proprietary data will be assured by employing the West Virginia University research confidentiality procedure. The source of confidential data will not be published or in any way associated with the submitting party.

Use of the Database

In consideration for submission of silica data, data contributors will have access to the entire data set (with confidentiality protections) to conduct whatever analyses they desire. The ACGIH Construction Committee will also conduct an analysis of the data that will provide estimates of exposures by a variety of grouping categories (job, project type, tool, task, etc.). These estimates will ultimately be published on the ACGIH web page. They will also be used as the basis of a written guide to silica exposures in construction to be published by ACGIH.

Testing of the template and data entry systems is scheduled for May 2001, followed by full-scale collection and entry of data sets from July through December, 2001. The committee intends to complete and publish its first analysis of the exposure data by July, 2002. Analysis could be conducted on a periodic basis as new data is submitted.

The scope of this project has grown from the initial plan to assemble a few publicly available exposure data sets into a web-based method for collecting and disseminating exposure data that rarely becomes available to researchers and the public. This project may provide an example of how data sources can be maximized and made available in ways that can improve the occupational hygiene community's ability to estimate exposures and protect workers' health.

We Need Your Help

Please consider submitting your silica exposure data. If you or your organization can benefit from an improved ability to estimate and control silica exposures, or you wish to assist the larger occupational health community increase its knowledge of the nature and degree of silica exposures, please visit the silica database web page at http://www.wvu.edu/%7Eexten/depts/she/silica.htm, or call Paul Becker at (304) 293-3039, Magdy Akladios at (304) 293-3189, or Mary Ellen Flanagan at (206) 543-9711.

The following official and unofficial members of the ACGIH Silica Subcommittee have contributed to this project (organizational affiliation indicated for identification purposes only):

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