

# Expanding control banding for workplace silica exposures throughout the Americas

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**Background:** Silicosis, a lung disease caused by inhaling respirable crystalline silica dust, is an occupational illness affecting millions of workers worldwide. The National Institute for Occupational Safety and Health (NIOSH) has partnered with the World Health Organization, the International Labour Organization, and multiple agencies in the Americas to implement the program “The Elimination of Silicosis in the Americas”.

**Objectives:** One component of this program is control banding, a qualitative risk assessment and management strategy that allows non-experts to use task-based hazard data and potential exposure information to determine appropriate controls.

**Results:** From 2005 to the present, NIOSH occupational health researchers have worked with experts in Chile, Peru, Colombia, and Brazil to assess, implement, and provide tools to evaluate the use of control banding methodology.

**Keywords:** Control banding, Silica, Silicosis, International collaboration

## Background

Silicosis is an incurable, progressive, disabling, preventable fibrogenic lung disease caused by inhaling respirable crystalline silica (RCS) dust. The form and severity of silicosis depend on the type and extent of exposure. Chronic, accelerated, and acute forms are recognized. Pulmonary tuberculosis (silicotuberculosis) is a frequent cause of death in people with silicosis. Exposure to RCS is associated with lung cancer, airways diseases, and possibly autoimmune disorders, chronic renal disease, and other adverse health effects.<sup>1</sup> Approximately 8800 deaths and 486 000 disability-adjusted life years in 2000<sup>2</sup> contribute to the global burden of silicosis.

Quartz, the most common form of crystalline silica and a component of most mineral deposits, is in a wide variety of materials in industry and work settings, including masonry, stonework, construction, dental laboratories, pottery manufacturing, and mining. Although the precise global prevalence is unknown, at least an estimated 1.7 million US workers are exposed to RCS.<sup>1</sup>

## Elimination of Silicosis in the Americas

Silicosis is incurable, but preventable. The International Labour Organization (ILO)/World Health Organization (WHO) Global Program for the Elimination of Silicosis was established in 1995.<sup>3</sup> Silicosis prevention strategies should include primary and secondary approaches. Primary prevention focuses on the control

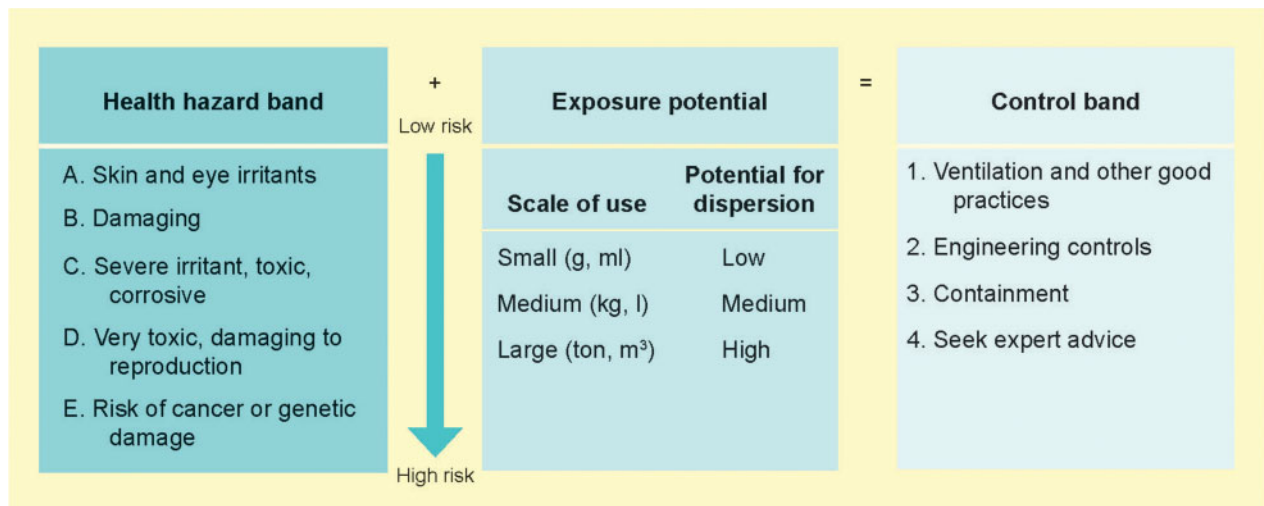
of RCS dust hazards at the source, while secondary prevention involves surveillance of the work environment and of the workers. Control banding, the focus of this project, is a qualitative risk assessment and management strategy that addresses primary prevention.<sup>4</sup>

In 2005, the National Institute for Occupational Safety and Health (NIOSH) of the Centers for Disease Control and Prevention, partnered with the WHO, the Pan American Health Organization, and the ILO and countries in the Americas to initiate the “Elimination of Silicosis in the Americas” program. This program utilizes subject matter expertise in silica measurement, dust control, diagnosis, and surveillance of silicosis. It is through NIOSH participation in the WHO Global Network of Collaborating Centers that requests for assistance or exchanges of information are initiated.

Control banding allows non-experts to use task-based hazard data and potential exposure information to determine appropriate controls. NIOSH has collaborated with agencies in the Americas to assess how control banding approaches can reduce RCS dust exposure. The joint activities have included providing control banding workshops, translating the United Kingdom (UK) Health and Safety Executive’s (HSE) Silica Hazard Control Guidance Sheets (guidance publications based on control banding concepts for specific industries in the UK),<sup>5</sup> and the development of simpler control banding systems.

Control banding guides the assessment and management of workplace risks. It is a generic technique

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**Figure 1** Factors comprising the control banding approach to address occupational hazards (adapted from UK HSE COSHH Essentials<sup>5</sup>).

that determines a control measure based on a health hazard band (i.e. grouping of chemicals or other agents in categories of similar toxicity and physical characteristics) or the occupational exposure limit and the potential for exposure (based on quantity of a chemical or material characteristics, and the process associated with its use; see Fig. 1). Control banding is based on two pillars: (1) a limited number of control approaches exist to address occupational hazards, and (2) many challenges with occupational exposures have been identified, assessed, measured, and addressed with solutions.<sup>6</sup> In developing nations, access to professionals with experience evaluating and controlling exposures is limited, so without adequate preventive measures to limit exposures to occupational hazards, adverse health effects will continue.

Using the conventional control banding models, substances classified as carcinogens such as RCS, would automatically be assigned to the highest hazard category and subsequently the highest control level: seek expert advice. Consequently, the authors of the HSE UK COSHH Essentials recognized the need to provide additional control-focused guidance for dealing with silica exposures, which led to the development of the silica essentials. NIOSH familiarity with the silica essentials and control banding led to the exploration of their utility in the ILO/WHO Program described above.

### Chile

In 2005, after a team of environmental and occupational health researchers from NIOSH provided Chile with a brief introduction to control banding, the Institute of Public Health (ISP) of Chile requested additional assistance. In 2006, NIOSH presented a 3-day technical training course, including the “Application of Control Banding Methodology”, at the Chilean ISP in Santiago. This course presented methods to evaluate risk, assess exposure, design and

evaluate the effectiveness of interventions, and use technology to control hazardous exposures to RCS dust. In 2007 at ISP in Santiago, NIOSH and ISP jointly sponsored a control banding workshop to develop simple and inexpensive control guidance for brick-making and stone-crushing small businesses. Later that year, NIOSH field team researchers accompanied the Chilean ISP to additional field sites to evaluate dust concentrations and help develop control guidance for dental laboratories and stone crafts worksites. Figure 2 shows a stone-crushing plant near Santiago during a 2007 field survey.

### Peru

In 2008, a five-member research team from NIOSH visited Peru’s National Institute of Health to present a technical course on silica and heavy metals, emphasizing laboratory analyses, sampling, quality assurance, evaluation of interventions, and control banding. Later in 2010, during the third Latin American Summit for the Elimination of Silicosis, the ministries hosted a half-day workshop on establishing a control banding approach for industries throughout the



**Figure 2** Stone crushing in Santiago, Chile, 2007.



**Figure 3 Control banding workshop at the 3rd International Summit for the Elimination of Silicosis, in Lima, Peru, 2010.**

country. Representatives from the ministries, regional directors, and labor inspectors participated so they could train other health and safety professionals within their designated regions (Fig. 3). In collaboration with the Chilean ISP, the Peruvian Ministry of Health plans to include a control banding approach to silica exposure control in legislation.

### Colombia

In 2009, in Bogota, Colombia, the Colombian Safety Council (CSC) held the Forty-second Annual Health, Safety, and Environmental Congress. The CSC identified exposure control as a critical need for the Colombian workforce and invited NIOSH to present a seminar on control banding. The seminar introduced the concept, online toolkits, basic engineering controls, and the evaluation of intervention effectiveness. A similar workshop was delivered in 2010 in Sao Paulo, Brazil at FUNDACENTRO in collaboration with the Brazilian Occupational Hygiene Association and in 2011 in Caracas, Venezuela, at the Venezuelan Occupational Hygiene Association annual conference. In 2010, NIOSH provided a lecture to the Colombian National Cancer Institute on using control banding to eliminate silicosis. The Colombian Ministry of Health is developing legislation that includes a control banding approach to controlling RCS and other occupational carcinogens.

### Lessons Learned

Workers in common occupations and industries associated with generating airborne RCS (e.g. mining, quarries, foundries, construction, and arts and crafts) have a risk of developing silicosis. Risks associated with exposure to hazardous substances are on the rise due to rapid industrialization and globalization. Today, much of the workforce is composed of small- to medium-sized enterprises with limited access to safety expertise and resources. Control banding provides a promising practical approach to control exposures to occupational hazards and thereby improve occupational health and safety. The UK HSE developed Silica Hazard Control Guidance

Sheets to help small businesses apply control banding principles to reduce RCS exposure.<sup>5</sup>

Although NIOSH and ISP translated these documents into Spanish, Chilean experts determined the guidance as written was too complicated. The UK Silica Hazard Control Guidance Sheets are designed to enable small businesses in highly developed nations to control RCS dust exposures. Some of the suggested controls are too advanced for some nations, necessitating a similar but more basic method based on the available equipment, technology, and terminology from that specific region rather than from the United Kingdom. ISP adapted the approach to fit the needs of small businesses in Chile and is developing the Qualitative Evaluation of the Risks of Exposure to Silica (ECRES, for its acronym in Spanish). These sheets, based on the UK HSE Silica Hazard Control Guidance Sheets, have been designed for Chilean industries to evaluate and prioritize workplace hazards. Through inter-country collaborations, the Peruvian Ministry of Health is designing its own qualitative evaluation tools for industries with potential RCS exposure, based on the ISP ECRES method.

### Summary

These international collaborations have proven mutually beneficial for presenting the promise and the limitations of control banding. NIOSH will continue to track progress and provide assistance when feasible in these endeavors. In addition, to aid dissemination of control banding methodology, NIOSH is designing a train-the-trainer control banding workshop, which will be available for download through the NIOSH Web site. Figure 4 presents a timeline summarizing major international activities performed.

### Disclaimer

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### Resources: Control Banding

Control banding is a strategy that may be used to eliminate silicosis, as well as to address other occupational hazards. More information regarding control banding can be found on the NIOSH Control Banding topic page, <http://www.cdc.gov/niosh/topics/ctrlbanding/> and in a comprehensive NIOSH document entitled *Qualitative Risk Characterization and Management of Occupational Hazards: Control Banding (CB)*.<sup>4</sup>

Additional information about the Global Program for the Elimination of Silicosis can be found at:

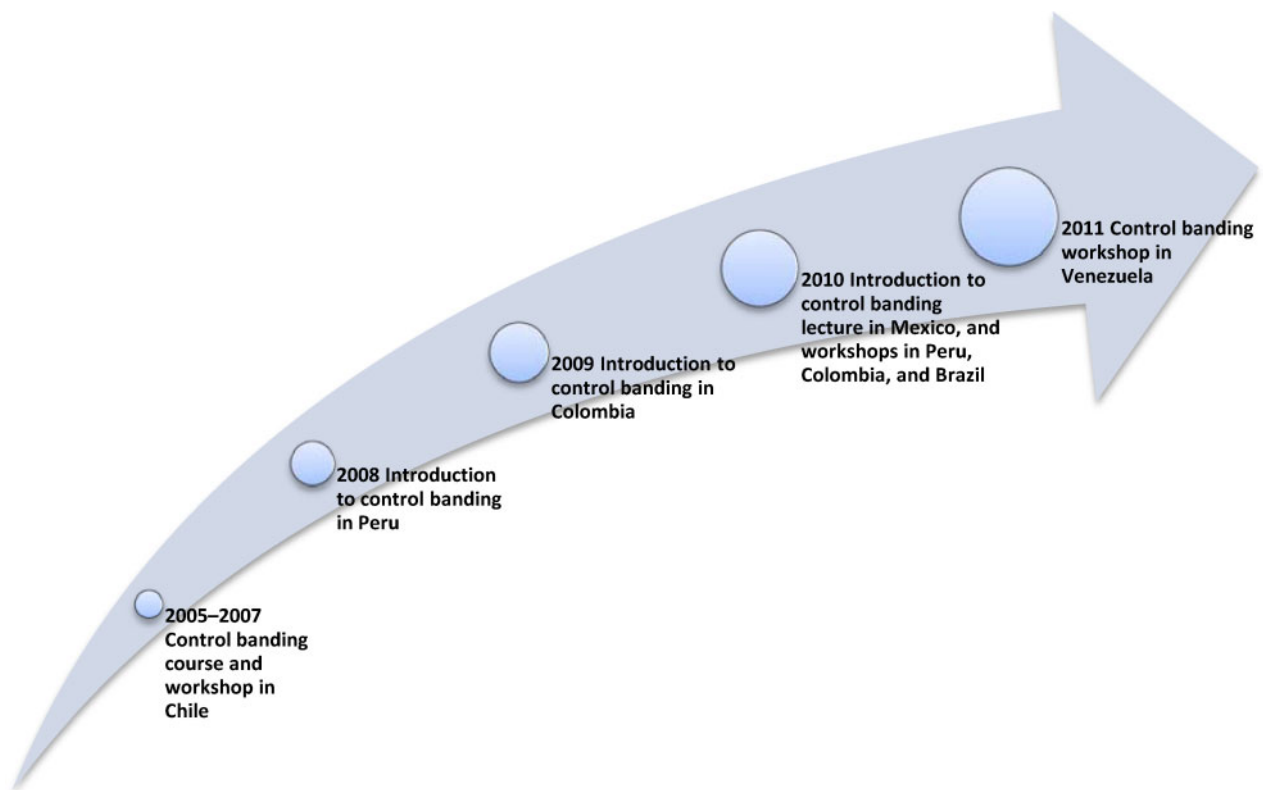


Figure 4 NIOSH global collaborations on control banding in the Elimination of Silicosis in the Americas.

[http://www.who.int/occupational\\_health/publications/newsletter/gohnet12e.pdf](http://www.who.int/occupational_health/publications/newsletter/gohnet12e.pdf)

Additional information regarding the WHO Network of Collaborating Centers can be found at: [http://www.who.int/occupational\\_health/network/en/](http://www.who.int/occupational_health/network/en/)

Additional information about the COSHH Essentials can be found at: <http://www.hse.gov.uk/coshh/essentials/index.htm>

The silica control guidance sheets are available for download on the Health Safety Executive's website at: <http://www.hse.gov.uk/pubns/guidance/>.

The silica control guidance sheets are available in Spanish for download on the ILO website at: [http://www.ilo.org/legacy/spanish/protection/safework/coshh\\_essentials\\_silica/index.htm](http://www.ilo.org/legacy/spanish/protection/safework/coshh_essentials_silica/index.htm)

The Occupational Safety and Health Administration (OSHA) has developed a best practice guidance e-tool for silica, available at: [http://www.osha.gov/dsg/etools/silica/protect\\_against/protect\\_against.html](http://www.osha.gov/dsg/etools/silica/protect_against/protect_against.html)

### Acknowledgements

We would like to offer appreciation to all of our international partners for their devotion to the elimination of silicosis. We would also like to thank John Lechliter for editing this document and Maria Lioce, Marilyn Fingerhut, Donna Heidel, Anne Bracker, Wendy MacDonald, and Deborah Nelson

for reviewing this manuscript. Support for this research was provided by the Chilean Institute of Public Health, the Venezuelan Occupational Hygiene Association, the Corporation of Occupational and Environmental Health (Medellin, Colombia), and the Brazilian Occupational Hygiene Association.

Disclosure: The authors declare no conflicts of interest.

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