



ENVIRONMENTAL HEALTH
& ENGINEERING, INC.

EXPOSURES TO CRYSTALLINE SILICA AND METALS IN CERAMIC AND GLASS TILE

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RESEARCH SUMMARY

INTRODUCTION

This research summary describes an analysis of potential human health risks associated with the ceramic and glass tile products of specific manufacturers. The research was commissioned by the Tile Council of North America (TCNA), with additional support from Confindustria Ceramica (CC), Centro Ceramico Bologna, and the TCNA Product Performance Testing Laboratory, and conducted by Environmental Health & Engineering, Inc. (EH&E). A list of the manufacturers whose products and data were examined to date is provided at the end of this summary. This information is being provided at this time to participants at Total Solutions Plus, with the understanding that a final report will be forthcoming. Data and product analysis is underway from additional manufacturers. Opportunity remains for additional tile manufacturers to participate in this significant study for the tile industry.

SCOPE

The objective of the research was to provide TCNA with information relevant to labeling requirements in the State of California per Proposition 65 (Prop 65). To complete this objective EH&E carried out the following tasks: interviewed tile professionals to characterize tile installation practices, measured the chemical composition of commonly sold tile products, performed controlled experiments to quantify emissions of chemicals when a tile is cut, and completed searches of the literature to determine the number and types of tile installers. EH&E combined this information to estimate lifetime average exposure concentrations and associated health risks.

RESULTS

Based on measurements of representative tile products, data from the manufacturers of 190 tile brands, and published information on the materials from which tile is manufactured, EH&E focused its analysis on 12 chemicals that are regulated by Prop 65: crystalline silica, antimony, arsenic, beryllium, cadmium, chromium, cobalt, lead, nickel, selenium, titanium, and vanadium. Interviews that reflect work practices of approximately 180 professional tile installers indicate that cutting tile is expected to be the largest source of exposure to chemicals in tile, with the vast majority of all tile cuts made with a powered wet saw, manual score and snap cutter, or manual nipper. Only a de minimis number of tile cuts are made with a powered dry-cutting saw or grinder with or without a dust collection system, primarily outdoors.



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Controlled tests of cutting tile show that airborne emissions of crystalline silica and metals are strongly related to their concentrations in tile. The testing also demonstrated that emissions from manual cutting tools are up to 50-fold lower than from a powered wet saw. Published studies of similar cutting tools indicate that emissions from a wet saw are approximately 100-fold lower than from a powered dry saw without emission controls. The chemical emissions from cutting tile developed by this research were used to evaluate inhalation exposure concentrations for tile mechanics. Information obtained through interviews and from the literature indicate that tile is installed primarily by three groups of people: professional tile installers, professional floor coverers, and do-it-yourself installers. Professional tile installers reported working with ceramic tile or natural stone on a regular basis. In contrast, professional floor coverers install tile as well as carpet, vinyl, wood, and other types of flooring. Do-it-yourselfers install tile up to a few times in a lifetime, substantially less than professional floor installers. Data on the frequency and duration of tile cutting obtained for these three groups of installers were used to estimate long-term time-weighted average (TWA) exposure to tile-related emissions per Prop 65.

Estimated TWA concentrations of crystalline silica, antimony, arsenic, beryllium, cadmium, chromium, cobalt, lead, nickel, selenium, titanium, and vanadium for all three groups were below the safe harbor levels and benchmarks for lifetime cancer, developmental, and reproductive risk established by Prop 65. These results are specific to the tile brands and data examined and cannot be generalized to other tile products without additional analysis.

Although not a specific aim of this research, the analysis is also useful for comparing tile-related exposures to applicable workplace exposure standards, such as the new OSHA crystalline silica rule.¹ The rule established an action level of 25 µg/m³ and a permissible exposure limit (PEL) for crystalline silica of 50 µg/m³ over an 8-hour period. The rule also specifies numerous powered cutting tools and controls that if employed do not require exposure monitoring. This study indicates that 8-hour TWA concentrations of crystalline silica attributable to cutting tile are well below the action level and PEL when the OSHA-recommended methods are used. This study also provides data on crystalline silica exposure from manual methods, a category that is not specifically addressed by the rule. The testing showed that emissions from score and snap cutters are orders of magnitude lower than from the power tools recommended by OSHA for cutting materials that contain crystalline silica. This information may be useful to OSHA, businesses, tile installers, and occupational health professionals as they incorporate the crystalline silica rule into their work practices.

1) 29 CFR §1926.1153, Respirable crystalline silica



PARTICIPATING TILE MANUFACTURERS

North America

Alcobe Ceramicos S.A. de C.V., *ALCESA*
Arto Brick California Pavers, *Monrovia, Oleson, Studio, California Revival, 2d Impressions, Decos*
Atlas Concorde USA, Inc., *Atlas Concorde USA*
Caesar Ceramics USA, *Caesar USA*
Ceramiche Marca Corona USA LLC, *1741 Di Marca Corona, Marca Corona Contract*
Crossville Inc., *Crossville*
Dal-Tile Corporation, *Daltile, American Olean, Marazzi, Ragno, & Mohawk Hard Surfaces*
Del Conca USA, Inc., *Del Conca USA*
Florida Tile
Florim USA, Inc.
Interceramic
Ironrock Capital Inc., *Metropolitan, Ceramincs, Quarry Tile Manufacturas*
Manufacturas Vitromex Sa Oecv & Vitromex USA, *Vitromex, Artemis, Arko, Oem Brands and Unbranded Products*
Mirage Granito Ceramico U.S.A. Inc., *Mirage USA*
Nitropiso S.A. de C.V., *Tecnotide, Nitrotile*
Oceanside Glasstile Company
Porcelanite Lamosa S.A. de C.V., *Porcelanite, Lamosa, Firenze*
Sonoma Tilemakers
Summitville Tiles, Inc.
UST Inc., *Landmark Ceramics*

Italy

Abk Group, *Abk, Ariana, Casa Tua, Flaviker*
Abm S.R.L., *Candia Valpanaro, Art Casa*
Altaeco S.P.A., *Appiani, Ceramica Vogue*
Armonie by Arte Casa Ceramiche S.P.A., *Armonie*
Casalgrande Padana S.P.A., *Casalgrande Pandana*
Cedir Ceramiche di Romagna S.P.A., *Cedir, Imolagres*
Ceramica Colli Di Sassuolo S.P.A., *Ceramica Colli Di Sassuolo*
Ceramica Del Conca S.P.A., *Del Conca, Pastorelli*
Ceramica Euro S.P.A., *Ceramica Euro Spa and Fly Zone*
Ceramica Faetano S.P.A., *Faetano*
Cermica Fondovalle S.P.A., *Fondovalle*
Ceramica Mediterranea S.P.A., *Mediterranea*
Ceramica Sant'agostino S.P.A., *Ceramica Casamia, Ceramica Gresitalia, Ceramica Sant'agostino*
Ceramica Valsecchia S.P.A., *Valsecchia*
Ceramiche Ascot S.P.A., *Ascot Ceramiche, Dom Ceramiche*
Ceramiche Atlas Concorde S.P.A., *Atlas Concorde, Atlas Concorde Solution, Ceramiche Keope/Keope contract, Supergres*
Ceramiche Caesar S.P.A., *Caesar, Fap Ceramiche*
Ceramiche Ccv Castelvetro S.P.A., *Ceramiche Ccv Castelvetro*
Ceramiche Mac3 S.R.L., *Mac3*
Ceramiche Marca Corona S.P.A., *1741 Di Marca Corona, Marca Corona, Marca Corona Contract*
Ceramiche Mariner S.P.A., *Mariner*
Ceramiche Moma S.P.A., *Idea Ceramiche, Paul & Co.*
Ceramiche Refin S.P.A., *Ceramiche Refin*
Ceramiche Serra S.P.A., *Ceramiche Serra*
Ceramiche Settecento Valtresinaro S.P.A., *Settecento- Mosaici E Ceramiche D'arte*

Cerindustries S.P.A., *Cerdomus, Porcellana Di Rocca*
Coem S.P.A., *Blu Art Stone, Ceramica Fioranese, Ceramiche Coem Manifattura*
Cooperative Ceramica di Imola, *Imola, Lafaenza, Leonardo*
Eco Ceramica S.P.A., *Eco Ceramica, Arkadia*
Elios Ceramica S.P.A., *Elios Ceramica*
Emilceramica S.R.L., *Emilceramica, Emilgroup, Ergon, Viva, Provenza, Acif*
Etruria Design S.R.L., *Etruria Design*
Faro Ceramiche S.R.L., *Faro Ceramiche, Dolcevita, Basilica*
Fincibec S.P.A., *Century, Fincibec, Fire, Monocibec, Naxos*
Florim Ceramiche S.P.A., *Casamood, Cedit Ceramiche d'Italia, Cerim, Floor Gres, Rex Ceramiche Artistiche, Casadolceca, Florimstone*
Gambinigroup S.P.A., *Gambini Tile On Time*
Gamma Due S.P.A., *Ornamenta*
Gold Art S.P.A., *Energie Ker*
Gruppo Beta S.P.A., *Astor, Edimax*
Gruppo Ceramiche Gresmalt S.P.A., *Abitare La Ceramica, Materia Design, Sintesi Ceramiche*
Gruppo Ceramiche Ricchetti S.P.A., *Cerdisa, Cisa, Ricchetti*
Gruppo Romani S.P.A., *Cerasarda, Cercom, Cir, Ngt, Seremissima*
Gs Luxury Group S.P.A., *Ducati, Gs Luxury, Tonino Lamborghini Tiles X Style*
Happy House S.R.L., *Happy House*
Herberia S.P.A., *Herberia*
Horus Art Ceramiche S.R.L., *Horus Art Ceramiche*
Industrie Ceramiche Piemme S.P.A., *Ceramiche Piemme Floor And More, Valentino Lifestyle By Ceramiche Piemme*
Italgraniti Group S.P.A., *Impronta, Italgraniti*
Keradam S.R.L., *Keradam*
Kronos 2 Ceramiche S.P.A., *Kronos Ceramiche*
La Fabbrica S.P.A., *Ava*
La Fenice S.R.L., *La Fenice*
Laminam S.P.A., *Laminam, Restile*
Marazzi Group S.R.L., *En Place, Forme, Gallery, Marazzi, Masterker, Ragno, Unika, Villa*
Mirage Granito Ceramico S.P.A., *Infinity, Mirage*
Novabell S.P.A., *Novabell*
Nuova Ri.Wal Ceramiche S.R.L., *Saime, Alfalux*
Nuovocorso S.P.A., *Nuovocorso*
Panariagroup Industrie Ceramiche S.P.A., *Blustyle By Cotto D'este, Cotto D'este, Fiordo Industrie Ceramiche, Lea Ceramiche, Love Tiles, Margres, Panaria Ceramica*
Rondine S.P.A., *Aemilia 53, Ashford, Castille, Ceramica Rondine, Gap Tile, Montalcino, Premium*
San Valentino Manifatture Ceramiche S.P.A.
Santa Marla S.R.L., *Capri*
Savoia Italia S.P.A., *Savoia Italia, A.L.CO Ceramiche*
Sichenia Gruppo Ceramiche S.P.A., *Phorma, Sichenia*
Sicis S.R.L., *Sicis*
Sima Ceramiche S.R.L., *Simagres*
Stile Italia S.R.L., *Stile Italia*
Terratinta Group S.R.L., *Terratinta Ceramiche, Ceramiche Magica*
Unicom S.R.L., *Unicom Starker*
Valllunga & Co S.R.L., *Valllunga*
Verde 1999 S.R.L., *Verde 1999, Ceramiche Campogalliano, Ceramicasa*
41zero42 S.R.L., *41zero42*



ENVIRONMENTAL HEALTH & ENGINEERING, INC.

COMPANY PROFILE

Environmental Health & Engineering (EH&E) helps clients optimize their work environment, compliance program and building performance to prevent disruptions to vital operations and to maximize attention to business goals. Our professional scientific and engineering staff provides expertise in over 80 technical disciplines, and includes recognized experts in many scientific fields. We bring innovative and sound scientific solutions to each business challenge, and offer honesty and integrity to each business client.

EH&E's staff has extensive experience in engineering, energy efficiency, industrial hygiene, environmental health and safety compliance, risk management and communication, and indoor environmental quality. In business for over 25 years, EH&E is known for complex problem-solving abilities, innovative solutions and exceptional service. We work nation-wide with hospitals, biotechnology and research facilities, academic institutions, law firms, and commercial real estate and property management companies.

SERVICES

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 - Environmental Risk Management
 - Environmental Compliance & Permitting
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 - LEED Design Services
 - HVAC Design Review
- ▶ **Exposure & Risk Analysis**
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 - Biological
 - Hazardous Materials
 - Flood
 - Fire

