

Lung Hazards, Including Asbestos, Silica, Dusts, Fumes, and Smoking

Construction work has long been known to be hazardous to workers' lungs. Worksites tend to be dusty, as bags of cement are opened, wood products and masonry are cut, and heavy equipment moves across the earth. Fumes are produced, for instance, by painting, gluing, cleaning with solvents, welding, and the use of heavy equipment.

Three centuries ago, in 1713, Dr. Bernardino Ramazzini wrote about dust that "would gradually prove fatal to stone-cutters who took no precautions."¹ Silicosis, a disabling lung disease caused by exposure to crystalline silica (found in quartz rock), was identified in the late 1800s.² An increased risk of lung cancer among insulation (asbestos) workers in the United States was documented in 1964.³

Other lung problems faced by construction workers and documented more recently include an increased risk of tuberculosis and lung cancer from exposure to silica; asbestosis, which is disabling and potentially fatal; asthma and fluid in the lungs from gases and fumes produced during welding; and lung irritation and carbon monoxide poisoning from diesel exhausts, particularly during tunnel and highway construction.⁴

The numbers of deaths from silicosis and from exposures to asbestos are believed to be declining, but the National Institute for Occupational Safety and Health has said silicosis deaths are underreported. And while work around asbestos has been tightly regulated in the United States since 1976, new exposures continue during unprotected (and illegal) demolition and abatement work.⁵

Unfortunately, conclusive studies relating disease to work-related exposures are difficult to obtain. One reason is that workplace exposures to hazards may not result in symptoms of disease for years or decades. As a result, cases of silicosis, tuberculosis, asbestosis, mesothelioma, or lung cancer are rarely documented as work-related in the Bureau of Labor Statistics system. In 2000, BLS reported a total of 100 nonfatal "dust diseases of the lungs" and 500 "respiratory conditions due to toxic agents" among the nation's 8.9 million construction workers.⁶ The BLS Census of Fatal Occupational Injuries, by definition, does not count illnesses.

Some statistical studies and large-scale medical screenings do suggest patterns of disease, however.⁷ The National Center for Health Statistics, a branch of the U.S. Department of Health and Human Services, publishes information based on death certificates

from about 20 cooperating states (the roster of participating states changes from year to year). Comparing the reported deaths in a given construction occupation, such as bricklayer, with the number that would have been expected for the general U.S. population produces proportionate mortality ratios, PMRs. A PMR is the ratio of the proportion of deaths attributed to a specific cause in an exposed group (construction trade) to the corresponding proportion in a U.S. reference population, matched for age, race, and sex. PMRs are used to find excess deaths from disease and differences between an exposed group and the reference population.

An analysis of death certificates for 1991-93 suggests that members of some construction trades in those states have about a 25% higher risk of death from "pneumoconiosis and other respiratory diseases" compared to the general U.S. population (matched for age, race, and sex) (chart 44a). (Recent medical tests have shown that some construction workers at nuclear weapons plants have been exposed to beryllium, but it is unclear whether the kinds of beryllium exposures that construction workers have experienced lead to significantly higher risk for beryllium disease of the lungs.)

From 1996 to 2002, 2,602 pulmonary (lung) function tests and chest X-rays were given to current and former construction workers at Department of Energy nuclear weapons facilities. At an average age of 58 and with an average 23 years in construction work, the workers were older and have worked longer in construction than the general construction population.

An average of 45% of the pulmonary function tests were abnormal compared with tests of men of the same age and height without known lung disease (chart 44b). Chest X-ray abnormalities, compared to what is expected among workers with no known lung disease, ranged from 19 to 44%, depending on the trade (chart 44c).

Cigarette smoking often compounds the risks of respiratory disorders among the construction trades. The risk of lung cancer increases 10-fold among smokers compared with nonsmokers exposed to asbestos – and smoking is more common among construction workers than in many other occupations (chart 44d).⁸ Among the 2,602 Department of Energy workers tested for lung problems in 1996-2002 – see above – only one-third reported never smoking. Current and former smokers reported smoking, on average, 30 and 25 years, respectively, about one pack a day.

1. Bernardino Ramazzini, *Diseases of Workers (De Morbis Artificum Diatriba)*, 1713. Translated by Wilmer Cave Wright, 167.

2. See Ian A. Greaves, Not-So-Simple Silicosis: A Case for Public Health Action, Commentary, *American Journal of Industrial Medicine*, 37:245-51, 2000.

3. Irving J. Selikoff, J. Churg, and E.C. Hammond, Asbestos exposure and neoplasia, *Journal of the American Medical Association*, 188:22-26, 1964.

4. See D.E. Snider Jr., The Relationship between Tuberculosis and Silicosis. *American Review of Respiratory Diseases*, 118:455-60, 1978; IARC, International Agency for Research on Cancer, World Health Organization. *IARC Monographs on the Evaluation of Carcinogenic Risks to Humans: Silica, Some Silicates, Coal Dust and para-Aramid Fibrils*, Vol. 68, Lyon, France, 1997, 210.

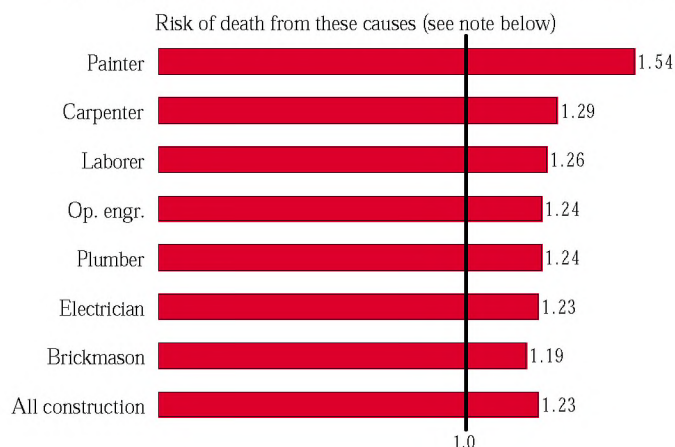
5. See *The Construction Chart Book, Second Edition*, pp. 43 and 44.

6. John Franklin, OSHA Directorate of Construction, personal communication, September 2002. (8.9 million figure is based on Census of Fatal Occupational Injuries)

7. See Antti Karjalainen, Rami Martikainen, Panu Oksa, Kimmo Saarinen, and Jukka Uitti, Incidence of Asthma Among Finnish Construction Workers, *Journal of Occupational and Environmental Medicine*, 44(8): 752-57, August 2002.

8. I.J. Selikoff, E.C. Hammond, and J. Chung, Asbestos Exposure Smoking and Neoplasia. *Journal of the American Medical Association*, 204:706, 1968.

44a. Approximate risk of death from pneumoconiosis and some other respiratory diseases, selected construction trades in about 20 states, 1991-93



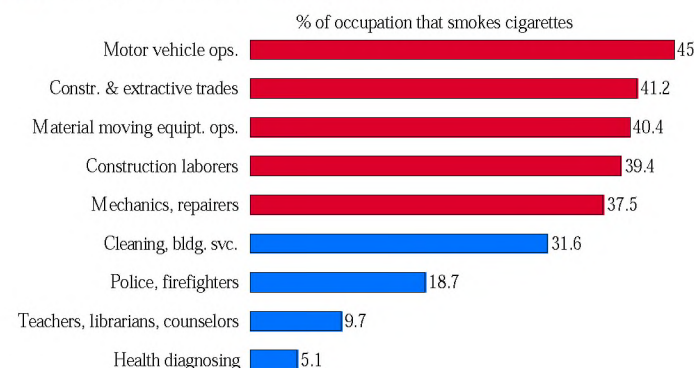
44b. Pulmonary function test results, selected construction trades, three Department of Energy nuclear weapons facilities, 1996-2002



44c. Chest X-ray results, selected construction trades, three Department of Energy nuclear weapons facilities, 1996-2002



44d. Percentage of smokers, selected occupations, 1998-2000 average



Note: Chart 44a - Risk is based on the proportionate mortality ratio (PMR). A PMR equal to 1.0 means that the proportion of deaths from a given cause among workers in a trade is equal to the proportion of deaths in a comparable age-race-gender reference U.S. population. A PMR of 1.25 means that the proportion of deaths from a given cause among workers in a specific trade is 25% higher than that observed in the reference population. "Pneumoconiosis and other diseases" includes, among other diseases, asbestosis, silicosis, pneumoconiosis from inorganic dusts (such as, beryllium), and respiratory conditions due to chemical fumes and vapors. Total of 5,771 observed deaths for construction workers from "pneumoconioses and other respiratory diseases," including 436 painters, 1,197 carpenters, 924 laborers, 288 operating engineers, 320 plumbers, 249 electricians, and 217 brickmasons. Trades shown are those for which the PMR was (statistically) significantly elevated. The number of states providing data changes from year to year.

Charts 44b and 44c - Total of 2,602 current and former DOE workers examined 1996-2002; average 58 years old and with, on average, 23 years in construction. Results are shown for trades in which 25 or more workers have been examined; the numbers examined and included in the charts are as follows: 89 painters, 76 millwrights, 220 carpenters, 83 teamsters/truck drivers, 132 sheetmetal workers, 47 asbestos workers, 406 laborers, 139 operating engineers, 474 electricians, 96 plumbers/steamfitters, 501 pipefitters, 160 ironworkers, and 66 boilermakers.

Chart 44b - Pulmonary function test used spirometry, with American Thoracic Society Standards. Chest X-rays were posterior-anterior classified by a B-reader following ILO Classification of Radiographs of Pneumoconiosis. Abnormal spirometry results were identified using the prediction equations and the 95 confidence interval defined by R. Crapo, A. Morris, and R. Gardner, Reference spirometric values using techniques and equipment that meet the ATS recommendations. *American Review of Respiratory Diseases*, 123:659-64, 1981.

Chart 44c - Any pleural abnormality was defined as the presence of any notation of positive findings according to sections 3A-D of the NIOSH ILO coding form and/or any parenchymal abnormality defined as ILO profusion score of 1/0 or greater.

Chart 44d - "Construction and extractive trades" include, among others, brickmasons, carpenters, drywall, electricians, glaziers, pile drivers, sheetmetal duct installers, tilersettters, and supervisors; "material moving equipment operators" include, among others, operating engineers; "mechanics and repairers" include, among others, elevator installers and equipment repairers and heavy-equipment mechanics.

Source: Chart 44a - Risana Chowdhury, The Center to Protect Workers' Rights, based on Multiple-Cause-of-Death Data 1991-93, National Center for Health Statistics (based on death certificates from about 20 states).

Charts 44b and 44c - The Center to Protect Workers' Rights, (Hanford Building Trades Medical Screening Program, Augusta [Ga.] Building Trades Medical Screening Program for the Savannah River Site) and the University of Cincinnati Medical Center (Oak Ridge Building Trades Medical Screening Program).

Chart 44d - Xiuwen Dong, The Center to Protect Workers' Rights, based on data from the National Health Interview Survey, National Center for Health Statistics.