The More We Learn, the More Things Stay the Same:
Notes on a Pioneer in Occupational Safety and Health

By Jane L. Seegal and John C. Lumsden[1]

Reliable data on occupational safety and health — particularly health — are hard to come by. But it appears that U.S. construction has a disproportionately high work-related injury and death rate, compared with other industries and construction in other industrialized countries. Construction worker safety and health has long been on a back burner. As recently as 1988, federal funding for safety research averaged $0.08 per construction worker, compared with $2.16 per manufacturing employee. Since 1990, however, funding for research in construction has increased, particularl through the National Institute for Occupational Safety and Health.

In addition to traumatic injuries and work-related musculoskeletal disorders, chronic health hazards are receiving close attention. These include asbestos and manmade fibers, lead and other metals, solvents, heat stress and extreme cold, hazardous wastes, and noise. New approaches to protect worker health are being implemented, based on findings reported at national and international conferences and in scientific publications.

But just how "new" are these findings

Fifty-five years ago, M.F. Trice, an industrial hygienist for the state of North Carolina, prepared a manuscript on safeguarding health in construction work. In a presentation for the state chapter of the American Society of Civil Engineers,[2] he touched most of the bases that occupational health experts knowledgeable about construction touch on today: substitution of materials, wet methods when dealing with dusts, exhaust ventilation, personal respiratory protection, improved design, and even pre-employment examinations. (Trice served as chairman of the American Conference of Government Industrial Hygienists in 1943.)

A sampling of Trice's writings in the state archives suggests Trice, whose first name was Marion, was a diligent public servant who covered a wide range of issues. As an employee of two state agencies, the former Board of Health and the Industrial Commission, he was likely expected to focus on mining, known as a "dusty" occupation. Problems with silica in mining had spurred formation of the Occupational Health Section of the Board of Health in the 1930s. From mining,

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[2]SAFEGUARDING HEALTH IN CONSTRUCTION WORK, by M.R. Trice, Industrial Hygienist, Division of Industrial Hygiene of the N.C. State Board of Health and the N.C. Industrial Commission, presented at the annual meeting of the N.C. Section, American Society of Civil Engineers, January 10, 1942, Duke University, Durham, N.C., 11 pages, typewritten. ASCE records show Trice was listed on the program to speak at 2 p.m. on "accident prevention and control of occupational hazards." Because of "the inability of Mr. Trice to be present," the paper was read to the group by a Professor Gotaas, according to ASCE records. A copy of Trice's paper is available on the Internet at http://www.cpwr.co

a jump to construction would have been logical, given the similarities between the two industries.

Trice begins his talk on construction-worker health hazards by acknowledging there's more than one way to protect health, including the safety engineer's "prevention of injury by accident." But the industrial hygienist says he will discuss the approach of the "industrial hygiene engineer who believes health conservation may be influenced by almost everything under the sun."

The first quarter of the talk covers silica and its compounds, which Trice describes as the "most important" health hazard in construction work. Constant exposure to silica dust causes a chemical reaction that "completely destroys" the lungs and leaves victims of the disease of silicosis "extremely susceptible to pulmonary tuberculosis" and an "early death." He notes the options of wet methods, including wet drilling, and exhaust ventilation to minimize dust exposures. For sandblasting, he recommends a positive-pressure air helmet or substitution with nontoxic materials, such as steel shot and alundum (or corundum). (Today, the National Institute for Occupational Safety and Health has seen no studies to rule out use of these substitutes.) Silica had long been known to be a health threat to construction workers; a decade before Trice's presentation, hundreds of workers died of silicosis after dry drilling through a sandstone mountain near Gauley Bridge, West Virginia, without respiratory protection.[3]

Silica is not the only hazard to construction workers' lungs. The air on construction sites normally contains potentially toxic dusts, fumes, and gases from when materials are cut, ground, blasted, crushed, drilled, and welded, and when heavy equipment lumbers across the earth.

Trice talks about toxic gases associated with dynamiting — carbon monoxide and oxides of nitrogen — based on his experience with underground mining; above ground these gases are not usually a problem in dynamiting. At the time, most underground mining in North Carolina was pegmatite mining, which included mica, feldspar, limestone, and marble. Trice mentions other potential sources of carbon monoxide, including "the operation of internal combustion engines in tunnels, or other poorly ventilated situations." These problems with carbon monoxide are still being documented in construction.

Welding is another source of nitrous oxides, "insidious poisons," in Trice's view. The use of bare rods, of low carbon steel, in electric arc welding, he notes, can produce fatal or severe pulmonar edema, partly caused by nitrogen peroxide. In 1936, he says, several workmen died at Baton, North Carolina, after exposure to nitrogen oxides in cleaning out the Gay-Lussac tower of a sulphuric acid plant used in fertilizer production. "None of the men died until they got home, then they literally drowned in the exudations of body fluids." He adds that the decomposition products from using coated welding rods are potentially hazardous to health.

The author talks about poisonous metal fumes from welding, such as lead, zinc, brass, bronze, and nickel, and notes that some produce symptoms that can be mistaken for common ailments. So, for instance, cadmium poisoning may produce "weakness, vomiting, headache, generalized

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[3]Martin Cherniak, *The Hawk's Nest Incident: America's Worst Industrial Disaster.* New Haven and London: Yale University Press, 1986.

pneumonia, and other disabilities."

Trice recommends keeping any work area well ventilated and discusses respirators, preferabl with an air-supplied helmet, when satisfactory ventilation is difficult. Recognizing the interests of his audience, however, Trice points out that worksite design can be used to provide adequate ventilation. His presentation mentions that a plant under construction in western North Carolina is to contain an exhaust ventilation system to protect workers from silica dust during grinding operations. That ventilation system may have been designed by Trice. Although the use of local-exhaust ventilation was not widespread at the time, the state employee used his engineering skills to design effective local-exhaust ventilation systems for North Carolina plants processing raw mineral ores and producing asbestos textiles. Today, industrial hygienists stress local-exhaust ventilation, which generally must be portable for construction, along with proper training and fitting of workers for respirator use, if ventilation is not enough.

There's more. Saying his time to discuss the issues is limited, Trice mentions irritation of the skin caused by contact with cement or concrete, a problem still being addressed. He mentions tar acne and cancer of the lips. He talks about "bruises and bone injuries due to constant pressure; or friction; or posture necessary to operate a machine," what we now call work-related musculoskeletal disorders, which are prevalent, costly, and potentially disabling. He talks of the dangers of inhalation of volatile solvents ("benzol poisoning") and heat stroke, and the need for sanitary drinking water on site.

He recommends pre-employment examinations to determine fitness for work, which he says are "becoming more and more a routine procedure on construction jobs." Such physicals are not routine in construction now, but are required by the U.S. Occupational Safety and Health Administration for special circumstances, such as asbestos and lead abatement and when respirators must be used.

The author does *not* discuss some longstanding issues that health professionals have become more aware of since then, such as asbestos, noise, and biological hazards (for instance, a soil fungus that causes histoplasmosis). Some potentially hazardous materials have been developed since Trice's time, such as epoxies. With hindsight, we can say Trice rails against washing hands and arms with gasoline for the wrong reason; gasoline does more than leave the skin dry, cracked, and susceptible to infection. And we know there's more to controlling heat stroke than "the wise use of salt." Nor was Trice the first to point out some of these problems. In 1700, in *De Morbis Artificum Diatriba (Diseases of Workers)*, Bernardino Ramazzini talked about dust that "would gradually prove fatal to stone-cutters who took no precautions." In Trice's time, W.C. Hueper, of the National Cancer Institute, wrote much of what is known today about occupational cancers.[4]

What remains noteworthy, though, is the thoroughness with which Trice documented hazards (and ways to control them) that persist a half-century later.

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[4]W.C. Hueper, *Occupational Tumors and Allied Diseases*. Springfield and Baltimore: C.C.Thomas, 1942.

Whether Trice was asked to speak about health in construction is unknown. The topic certainl was appropriate for civil engineers.

Perhaps to help justify his listeners' interest in worker-health issues, he mentions the "compensation possibilities." Because compensation for occupational diseases was established in at least 23 states, and many public and private agencies were engaged in industrial hygiene activities, he says, "the problem of occupational disease" cannot be ignored.

But, the author says, the "foremost reason" why civil engineers should be conscious of worker health in construction is "humanitarian." He points out the engineer's capacity to reduce hazards on the job. "Frequently, the supervision of all kinds of construction is the task of a civil engineer," Trice concludes, "and the man in charge should be able to recognize potential health hazards and know when to provide the necessary safeguards." That lesson still holds.

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