RAILROAD WELDERS, LUNG DISEASE, and the FELA

William P. Gavin

Employees of a railroad operating in interstate commerce who claim injury during the course of employment must seek damages under the Federal Employers' Liability Act (FELA),[1] the Safety Appliance Act,[2] or the Locomotive Boiler Inspection Act.[3] The FELA states that a railroad operating in interstate commerce whose negligence is the cause, in whole or in part, of employees' injuries is liable for damages to the employee.[4]

Employees who worked as welders and later developed lung cancer or other lung diseases may be entitled to compensation under the FELA. Railroads have known for a long time that electric arc welding produces noxious and toxic fumes.

In 1949, the U.S. Supreme Court ruled that an occupational lung disease is an injury within the meaning of the FELA.[5] This issue has not been reconsidered by the Court since, and the ruling is universally accepted by both state and federal courts. The relationship between welding fumes and lung disease should be reviewed thoroughly by lawyers working FELA cases.

Welding is performed in railroad operations wherever metal pieces need to be fused or where metal cracks must be repaired. The "trucks," bolsters, brake-beam hangers, and equalizer bars on railroad cars and various parts of locomotives frequently require welding.

In past decades, boilermakers, blacksmiths, and car men usually performed the welding. With changing operations, however, the need for blacksmiths and boilermakers has greatly diminished. Now car men do most of the welding. Since the task requires dexterity, the railroads usually select certain car men to do the work.

Railroad welding has been and is performed under a wide range of circumstances, including working indoors and within confined spaces. Some railroads have provided ventilated welding booths, but this is the exception rather than the rule.

For lung injuries to be covered under the FELA, the employee's duties at the time of the injury must directly and substantially affect interstate commerce. Courts have held that an employee working at equipment maintenance in a railroad shop satisfies this

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[1] 45 U.S.C. §§51-60 (1988).
[2] 45 U.S.C. §§1-14 (1988).
[3] 45 U.S.C. §§22-23 (1988).
[4] 45 U.S.C. §§51 (1988).
[5] Uric v. Thompson, 337 U.S. 163 (1949).

requirement.[6] Therefore, this requirement should not be difficult to establish in a suit seeking damages for injury from welding-fume exposure.

The Welding Process

Welding is a process by which metal is fused. The most common method is manual electric arc welding. It is performed by producing an arc of electricity between an electrode and the metal being welded. Temperatures created by the arc range between 3,000 and 4,000 degrees centigrade, causing the electrode and the metal to melt and fuse.

The electrode, also known as a welding rod, is held in a device sometimes known as a "stinger," which is connected to an electric power source. The arc is created by touching the tip of the rod against the metal being welded and moving it along the joint.

The composition of the welding rod varies with the metal being welded, because the rod must be compatible with the metal. Most modern rods are coated with a material known as "flux," which also melts during the process to form a cone around the weld. The cone of molten flux excludes atmospheric gases that could contaminate and weaken the weld. The molten flux also strengthens the weld. The composition of the flux on the rods varies greatly from rod to rod, but the flux often contains silicates, fluorides, borates, aluminum, cadmium, and chromium.

The welding process produces fumes. The composition and quantity of the fumes depend on the rods and the metal. Generally, however, the elements cadmium, iron, zinc, lead, chromium, nickel, manganese, and copper, as well as silicates, have been identified in the fumes.[7] Ozone, nitrogen peroxide, and carbon monoxide are also found.

Because of the variety of the contaminants, welding is sometimes referred to as an occupation of cumulative hazards. A claim of lung injury due to the fumes must, therefore, include investigation of the welding materials used. Also, since fume composition may be affected by the type of metal (for example, mild or stainless steel) and whether it is covered with paint or grease, attention must be given to these materials.[8]

Welding Fumes and Cancer

Numerous studies have established a substantially increased incidence of lung cancer among welders.[9] According to one study, "it is clear that welders have a

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[6] Shelton v. Thomson, 148 F.2d 1 (7th Cir. 1945); Maxie v. Gulf Mobile & Ohio R.R. Co., 219 S.W.2d 322, *cert. Denied*, 338 U.S. 823 (1949).

[7] James Beaumont & Noel Weiss, *Lung Cancer Among Welders*, 23 J. OCCUPATIONAL MED. 839 (1981).

[8] Bengt Sjogen et al., *Fever and Respiratory Symptoms After Welding on Painted Steel*, 17 SCAND. J. WORK ENV'T HEALTH 441 (1991).

[9] *See, e.g.*, Stern, *Cancer Incidence Among Welders: Possible Effects of Exposure to Extremely Low Frequency Electromagnetic Radiation (ELF) and to Welding Fumes*, 76 ENVTL. HEALTH PERSP. 221

relatively high lung cancer risk."[10] The same study of 3,247 welders employed through a local of the International Brotherhood of Boilermakers, Iron Ship Builders, Blacksmiths, Forgers and Helpers found that deaths due to lung cancer were 32 percent higher among welders than among the general population. For those who were employed longer than 20 years, the death rate was 74 percent higher than the rate for the general population.

The study found a high correlation between length of exposure and latency and increased lung-cancer deaths. Latency in this context refers to the time from beginning of exposure to onset of the disease. Therefore, an important question in any welding-fume lung-cancer case will be, How long did the claimant work as a welder before his lung cancer appeared?

The studies establishing an elevated risk of lung cancer among welders have not gone so far as to identify a specific carcinogen in welding fumes. This may be due to the wide range of substances that may be in the fumes. It should be remembered, however, that known lung carcinogens have been identified in these fumes.[11]

The fumes are known to cause or contribute to several types of lung disease, including cancer.

Siderosis. This is an accumulation of iron particles in the lungs. The particles are inhaled in the form of iron oxide, which is produced from the melting metal an core of the welding rod. After being inhaled, most of the particles are absorbed by macrophages, the lungs' scavenger cells, and transported to the lymphatic system. Lung biopsies, however, have shown iron particles in the alveoli and respiratory bronchioles where gas exchange occurs.[12]

Siderosis can be seen in chest X-rays taken of the afflicted welder.[13] The changes in the lungs are usually seen as nodular densities throughout the entire lung field, but the heaviest concentrations are seen in the middle third of the lungs. The X-ray changes resemble silicosis, a lung disease that is caused by inhaling silicon dioxide.

Early literature concerning siderosis did not associate the condition with substantial disability. It was felt that the iron particles produced, at worst, only localized scarring in the lungs. In 1955, Dr. Robert Charr, a frequent author on the subject, suggested that this belief should be reexamined.[14] As time passed, reports of significant

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(1987); Nikolaus Becker et al., *Risk of Cancer for Arc Welders in the Federal Republic of Germany: Results of a Second Follow-Up (1983-8)*, 48 BRIT. J. INDUS. MED. 675 (1991).

[10] Beaumont & Weiss, *supra* note 7, at 844.

[11] *See* W. KEITH MORGAN & ANTHONY SEATON, OCCUPATIONAL LUNG DISEASES 346, 669-70 (2d ed. 1984); Corky J. Hull et al., *Case-Control Study of Lung Cancer in Los Angeles County Welders*, 16 A.M. J. INDUS, MED. 103 (1989).

[12] M.D. Artfield & D.S. Ross, *Radiological Abnormalities in Electric-Arc Welders*, 35 BRIT. J. INDUS. MED. 117 (1978).

[13] A.T. Doing & A.I.G. McLaughlin, *X-Ray Appearances of the Lungs of Electric-Arc Welders*, 1 LANCET 771, 772 (1936).

[14] Robert Charr, *Respiratory Disorders Among Welders*, 71 AM. REV. TUBERCULOSIS 877 (1955).

pulmonary disability in welders began to appear in the medical literature.[15] Physicians identified substances other than iron – primarily silicon – in welding fumes as the agents responsible for lung scarring.[16] This scarring may gradually lead to emphysema.

Metal fume fever. This is a temporary condition characterized by cough, chest pain, a feeling of pressure in the chest, fever, malaise, and nausea. The condition has been associated with inhaling fluorides, cadmium, chromium, and zinc in welding fumes.[17]

Pulmonary edema. This is the abnormal accumulation of fluid in the air spaces an air passages of the lungs; the condition has been linked to exposure to welding fumes.[18] In the 1920s and 1930s, a number of deaths due to pulmonary edema were reported, particularly among welders who worked in closely confined spaces. The disease was caused by exposure to ozone and nitrogen peroxide gases created when the welding arc comes into contract with air.[19]

Recent studies have also associated welding-fume exposure with obstructive-airways disease. Changes in the air passages can obstruct to the flow of air to and from the lungs. It has been postulated that gases an particles toxic to the cells of the air passages stimulate them to change, thus narrowing or distorting the airways.[20]

In occupational-lung-disease litigation, a railroad typically defends itself by first arguing that it was not negligent as alleged because it did not know and could not have been reasonably expected to have known of the hazards of welding fumes. Abundant evidence to the contrary can be found.

A railroad's knowledge can be proved by introducing evidence that information was generally available in published medical literature before or while the plaintiff was employed. Welding-fume literature generally available in published medical literature generally dates back to the 1920s and 1930s.[21] A report describing siderosis was published much earlier – in a German publication in 1866.[22] Scientists and physicians

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[15] Robert Charr, *Pulmonary Changes in Welders*, 44 ANNALS INTERNAL MED. 806 (1956); Erwin Friede & Donald Rachow, *Symptomatic Pulmonary Disease in Arc Welders*, 54 ANNALS INTERNAL MED. 121 (1961).
[16] Friede & Rachow, *supra* note 15, at 126.
[17] *See* Laurence Fuortes et al., *Acute Respiratory Fatality Associated with Exposure to Sheet Metal and Cadmium Fumes*, 29 CLINICAL TOXICOLOGY 279 (1991).
[18] R. Morely & S.J. Silk, *The Industrial Hazard from Nitrous Fumes*, 13 ANNALS OCCUPATIONAL HYGIENE 101 (1970).
[19] Doig & McLaughlin, *supra* note 13, at 771.
[20] Kaye Kilburn & Raphael Warshaw, *Pulmonary Functional Impairment from Years of Arc Welding*, AM. J. MED., July 1989, at 62, 68.
[21] *See, e.g.*, Philip Drinker et al., *Metal Fume Fever: IV. Threshold Doses of Zinc Oxide, Preventive Measures, and the Chronic Effects of Repeated Exposures*, 9 J. INDUS, HYGIENE 331 (1927); Doig & McLaughlin, *supra* note 13, at 771.
[22] F.A. Zenker, *Ueber Staubinhalationskrankheiten der Lunge*, 2 DEUTSCH ARCHIVES KLIN. MED. 116 (1866).

have published their findings, theories, and conclusions concerning welding fumes and health throughout this century.

Most major U.S. railroads are members of an industry organization known as the Association of American Railroads (AAR). Since at least the 1930s, the AAR has maintained various committees consisting of employees from the member railroads. One committee is the Medical and Surgical Section, composed of the chief medical officers from the member railroads. Section minutes of many meetings show that the railroads were discussing exposure to iron dust and siderosis and questions of resulting disability as early as 1932.[23] The minutes from the 1965 meeting reflect that a book entitled *Pulmonary Diseases in the Railroad Industry* was distributed to those in attendance. The book listed welding and burning operations as a source of "noxious" fumes, gases, and dusts.[24]

Current evidence of a railroad's knowledge of welding-fume hazards may also be found on the containers in which welding rods are packaged. The packing for one brand, for example, states:

> WARNING: . . . FUMES AND GASES can be dangerous to health . . . . WARNING: The following chemicals may be hazardous during welding; iron oxide, manganese, silicon oxide, chromium, nickel, and fluorides.[25]

The package label also contains a Material Safety Data Sheet for the rods, describing chromium and nickel as possible carcinogens. Warnings on welding-rod packages constitute evidence of direct communication of hazards to the railroad. Conversely, the railroad will argue that the warnings were – or should have been – seen by the injured worker, who was contributorily negligent for not heeding the warnings.

A Freedom of Information Act request may be useful in obtaining information about whether the railroad has had claims of welding-fume illnesses among its employees.[26] Evidence of prior illnesses may be useful in establishing the railroad's knowledge of hazards.

Federal law requires that railroads operating in interstate commerce report certain injuries to the U.S. Department of Transportation.[27] A Freedom of Information Act request directed to the Department of Transportation and/or the Federal Railroad Administration may show that the railroad has had prior claims of injury by employees who had been exposed to the welding fumes. These claims constitute evidence that the

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[23] *See* MED. & SURGICAL SEC., AM. RAILWAY ASS'N. PROCEEDINGS OF THE 12TH ANN. MEETING (1932).
[24] *See* MED. & SURGICAL SEC., AM. RAILWAY ASS'N, PROCEEDINGS OF THE 45TH ANN. MEETING 151 (1965).
[25] Hobart Welding Electrodes 447A (AWS E6013).
[26] 5 U.S.C. §552 (Supp. 1991).
[27] 45 U.S.C. §§32, 38 (1988).

railroad knew that employees were claiming that welding-fume exposure could be harmful.

Counsel should also direct to the railroad interrogatories and requests for production seeking disclosure of prior welding-fume claims. The responses can then be compared to information obtained by the Freedom of Information Act request to determine the accuracy of the railroad's responses.

It is likely that the railroad will also contend that the employee was not exposed to significant levels of welding fumes. It is also likely that quantitative data concerning an employee's exposure will not be available. Nonetheless, counsel should request the railroad to produce all reports of its air samplings for welding fumes. This will not only ensure discovery of any air samplings of the employee's workplace but should also uncover reports of samplings for welding fumes in other work areas. These reports may contain valuable admissions by railroad industrial hygienists about hazards. Evidence of the employee's exposure will usually be in the form of testimony from both the employee and coworkers.

The railroad will also probably present a medical defense to the effect that the illness is not the result of exposure to welding fumes. The task of presenting this kind of defense will be much easier if the employee has a significant history of cigarette smoking.

Expert Witnesses

A suit based on welding-fume exposure will probably also involve expert testimony. Counsel should consider presenting the testimony of the following experts:

-- a physician specializing in pulmonary medicine, who should diagnose the plaintiff's illness and relate it to welding-fume exposure.

-- an industrial hygienist, who should evaluate the levels of the exposure and the constitutes in the fumes to which the plaintiff was exposed; and

-- an epidemiologist, who should testify that medical evidence of welding-fume hazards was available and that the railroad failed to heed it. This expert may also be useful in explaining scientific studies supporting a link between welding-fume exposure and the illness in question.

Railroads have known for years that welding fumes may be hazardous to the health of railroad workers. The injuries and diseases caused by these fumes are clearly covered under the FELA. Therefore, railroad workers who develop lung disease as a result of occupational exposures can be compensated.