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Dead Roses and Blooming Deserts: 
The Medical History of a New Deal Icon

Michelle Follette Turk

“They died to make the desert bloom. The United States of America will continue to remember that many who toiled here found their final rest while engaged in the building of this dam. The United States of America will continue to remember the services of all who labored to clothe with substance the plans of those who first visioned the building of this dam.”

Although a memorial plaque at the Hoover Dam sets the number of workers killed during its construction at ninety-six, the real figure was nearly double. In fact, the figure would have been much higher had it not been for the precedent-setting effort by the federal government, contractors, and workers to save as many lives as possible on the project.

Aside from its long unrecognized value as a jobs program, much needed stimulus to the fledging Las Vegas economy, and status as one of the “man-made wonders of the world,” Hoover Dam represented a major step forward for the American occupational health movement. Even though construction began during the last years of Republican rule, a time generally considered to be devoid of government intervention in behalf of labor, a variety of factors combined to make the project a crucial turning point in the history of

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1 Publicity for New Deal water projects evoked the image of making the desert “bloom as a rose.” Although the Boulder Canyon Project was not originally a New Deal initiative, Franklin D. Roosevelt and others used the project as a symbol of New Deal successes.

2 The inscription placed on a memorial plaque located at the Hoover Dam. The plaque, designed by Oscar J.W. Hansen, commemorates the men who died working on the Boulder Canyon Project and is located next to the “Winged Figures of the Republic” on the Nevada side of Black Canyon.

3 Records of the Bureau of Reclamation and Six Companies Inc. indicate that the figure ranged from approximately 114 to 187 individuals. The number varies because some reports overlook the numerous “pneumonia” victims poisoned by carbon monoxide as well as the “accidental” fatalities that occurred while “not officially” working on the project. The reports also leave out disease outbreaks and the workers’ families who died from heatstroke or project-related accidents. See the Six Companies records at “Summary of Fatalities by Employers – Boulder Canyon Project – To and including July 31, 1935,” Frank “Doc” Jensen Papers, 1 of 5, Special Collections, Boulder City Historical Society and Museum, and the Bureau of Reclamation, “Fatalities during the Construction of Hoover Dam,” http://www.usbr.gov/dataweb/dams/hoover_fatalities_table.htm.
occupational health care. Joseph Stevens, Dennis McBride, and other historians of the
dam have briefly described health conditions and the efforts undertaken to promote health,
but none has emphasized this watershed effect and how the project’s considerable health
risks forced the federal government to prod Six Companies Inc., to undertake major
initiatives to protect workers on the job. Eventually, the contractor developed a system to
provide job-related healthcare on the dam site and in Boulder City before the New Deal,
actions which boosted the entire occupational health movement.

In 1928, when a Republican-led Congress passed the Swing-Johnson bill
authorizing construction of a dam at Black Canyon, America’s occupational health
movement was at a crossroads. As past scholarship has demonstrated, most American
industries consistently ignored demands for occupational health reforms and job safety
until the Progressives, a party advocating for social justice, public safety, and equality,
raised the specter of urban epidemics to force progress on the issue. As the twentieth-

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4 For scholarship on this subject, see Joseph E. Stevens, *Hoover Dam: An American Adventure*, (Norman and
242-244, 261-264, 321, Guy Louis Rocha, “The I.W.W. and the Boulder Canyon Project:
The Death Throes of American Syndicalism,” *At The Point of Production: The Local History of the I.W.W.*,
*Hoover Dam and Boulder City, 1931-1936: A Discussion Among Some Who Were There*, Oral History

5 Most American industries overlooked occupational health until health awareness developed during the
Progressive Era, which lasted from the 1890s to the 1920s. Progressives attempted to fix the problems with
American society that developed during nineteenth-century industrialization. Environmental and public
health concerns evolved out of necessity because industrialization and urbanization created new health
concerns, prompting public health advocates like Alice Hamilton to speak out about disease epidemics and
occupational health concerns. See Christopher C. Sellars, *Hazards on the Job*, (Chapel Hill and London: The
Occupational Health in the United States,” *Origins of Occupational Health Associations in the World*,
1993), John Duffy, “Social Impact of Disease in the later 19th Century,” *Sickness and Health in America:
Readings in the History of Medicine and Public Health*, (Madison: University of Wisconsin Press, 1978), and
David Rosner and G. Markowitz, “Research or Advocacy: Federal Occupational Safety and Health Policies
century began, physicians and other health advocates worked with insurance companies, eager to hold down the cost of claims, to pressure lawmakers into creating municipal and state public health boards as well as the U.S. Public Health Service (PHS), which became the chief federal health agency by 1913. While the PHS enjoyed broad power to oversee occupational health in World War I defense industries, its powers shifted to state and local agencies during the conservative 1920s.

Beginning in 1908, states began passing worker’s compensation laws, but enforcement proved difficult. After 1910, a body of legal precedent gradually made it easier to hold negligent employers liable for job-related accidents and even pay compensation to injured workers—a dramatic shift from nineteenth-century practices. As a result, insurance companies did a brisk business-selling worker’s compensation policies to employers during and after the war. In the pro-business climate of the 1920s, employers held off reformers on a variety of fronts by lobbying sympathetic lawmakers, actively contesting suits in court, and hiring physicians who questioned whether workers’ diseases could be traced to the workplace rather than to the neighborhood and home. In many cases, conservative judges ruled in favor of management, a trend that discouraged future...
employee suits. Still, legal pressures forced many big employers to spend more money on job safety and even fund academic research into occupational job issues.

Thanks to these and other factors, the Boulder Canyon Project represented a major shift in American occupational health history. The project’s considerable health risks forced the federal government to mandate major health care and safety programs to protect the workers. The sheer number of employees working at the site tested the contractors’ commitments to occupational health.8 From 1931 to 1932, employees increased from 800 to 3,000 men and at the height of dam construction in June 1934, the project employed 5,128.9 Although many private companies struggling for profits often overlooked industrial hygiene issues, Six Companies’ employees benefited from being part of a project subject to federal oversight. The federal government had to intervene because the dam was an isolated project undertaken in a harsh desert environment. Early concerns about the construction site prompted the preventative measures to create a new type of occupational health program in the American workplace. President Hoover, a former civil engineer trained to improve efficiency in the production process, personally enlarged the federal government’s role in Black Canyon by eliminating the wasteful practice of employing and maintaining unhealthy dam workers. His policies included that workers would receive regular physicals and medical care, and would have access to first aid stations and a hospital. To oversee these initiatives, Hoover authorized the Bureau of Reclamation to

8 The contractors hired for the Boulder Canyon Project were Six Companies Inc., (which comprised of actually seven companies: Morrison-Knudsen of Boise, Idaho, Utah Construction of Ogden, Utah, Pacific Bridge Company of Portland, Oregon, Bechtel Corporation of San Francisco, California, and Henry J. Kaiser of Oakland, California, MacDonald and Kahn of Los Angeles, California, and J.F. Shea of Portland, Oregon), Lewis Construction Co., Anderson Brothers Supply Co., Boulder City Co., Newberry Electric Corp., The Babcock and Wilcox Co., and the Eichleay Engineering Corporation. Since Six Companies Inc. had the majority of workers and obligations, all contractors will be referred to as “Six Companies” in this paper. However, it is important to note that Six Companies was not the only contracting firm hired for the project.
play an active role in supervising occupational health at the dam site and in Boulder City. Consequently, the project’s chief occupational health program was the hospital and health care system built and managed by Six Companies. In addition, the project served as a venue for academic research on heat and fatigue and the contractor’s physicians used these findings to treat their patients. Finally, the legislative and legal systems also exerted an influence. Worker compensation laws required Arizona and Nevada to compensate injured workers and, with employer liability becoming easier to prove in all jurisdictions, employees gained increased help from the legal system.

Despite some minor setbacks, the Boulder Canyon Project fostered a cooperative environment in which insurance companies, physicians, academic researchers, the legal system, and the government worked together more than in previous decades. This relationship succeeded because it benefited all parties. Although early conditions at the town and dam site were less than satisfactory, this paper will reveal that advances occurred in 1931-32, long before New Deal legislation mandated them. The occupational health improvements on the Boulder Canyon Project did not immediately affect the occupational health movement nationally, but they represented significant federal effort to reform occupational healthcare practices on the job, paving the way for later New Deal policy.

Clearly, when Six Companies began its initial work at Black Canyon in 1931, the balance of power in the realm of occupational health still lay mostly with the employers. The project employed miners, mockers, carpenters, plumbers, electricians, engineers, railroad employees, clerical force, commissary attendants, truck drivers, riggers,

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mechanics, chemists, steelworkers, cement workers, and all forms of general labor. The men who lived in the makeshift, rag-tag community along the riverbank were in no position to insist on their rights. To be sure, the contractor paid little attention to appropriate sanitary, healthcare, and housing needs. The only housing available was at Williamsville, also referred to as Ragtown. The workers and their families lived in tents, shacks, cars, and trailers, and endured extreme heat, strong winds, thunderstorms, and flooding. Although Six Companies built temporary housing for tunnel workers on the canyon wall at “Cape Horn,” which was the river bend just above the dam site, both settlements offered little comfort. They bathed and drew drinking water from the Colorado River, which was contaminated by coliform bacteria, pathogens, and disease-producing bacteria and viruses. While no epidemics occurred at this time, there are reports that waterborne pathogenic diseases such as viral and bacterial gastroenteritis and typhoid fever contaminated the river and the drinking water tanks. Such diseases affected many workers and their family members.

Although Bureau of Reclamation Director Dr. Elwood Mead was aware of these brutal conditions, he did little to help. Mead thought the workers could survive the first summer without “great losses” and move to Boulder City in the fall. But he was wrong. On June 24, 1931, the Las Vegas Evening Review Journal reported that the dam site was

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12 The Great Depression expedited the commencement of the Boulder Canyon Project. Hoover and the Secretary of Interior Dr. Ray Lyman Wilber pressed Dr. Elwood Mead, director of the Bureau of Reclamation, to begin early because of unemployment. The Bureau of Reclamation rushed engineers to complete the project plans and construction began in the spring of 1931. Consequently, the construction of the dam began before adequate housing was built for the workers and their families in Boulder City.

13 Williamsville was located on the floor of Black Canyon. Lake Mead currently covers it. Estimates of Williamsville’s population in June 1931 range from 600 to 1,400 people.


140 degrees Fahrenheit in the sun and 120 degrees Fahrenheit in the shade. The average temperature during the summer of 1931 was 119.9 degrees Fahrenheit.\textsuperscript{17} Intense sweating subjected the workers to heat dehydration, also referred to as heat prostration or exhaustion, which resulted from a combination of thermal and cardiovascular strain. They experienced fatigue, dizziness, confusion, an increased pulse and respiration rate, and developed dry skin, mucous membranes, and mouths. Many times the workers’ condition developed into heatstroke, experiencing high body temperature, convulsion, swelling of the brain, coma, and even death.\textsuperscript{18} In their reports, Las Vegas physicians explained that their patient’s “regulating center” rose above normal, resulting in a “swelling of the brain and a resultant pressure.”\textsuperscript{19} Over the course of the next five years, many workers and their family members passed out or died of heatstroke.\textsuperscript{20} Although it is unknown exactly how many suffered from the heat, Six Companies records indicate that seventeen workers died from “heat prostration” in the summer of 1931.\textsuperscript{21} It is also unknown how many family members died during this time. To its credit, the contractor recognized the problem and revised the employees’ schedules to limit exposure to the sun.\textsuperscript{22} Nevertheless, the workers and their families experienced terrible burns on the skin from the sun and wind, leading many to believe they had caught a water-borne disease from the river.\textsuperscript{23} No epidemics occurred in 1931, but there was an outbreak of spinal meningitis as well as several

\textsuperscript{17} Ibid, 217.
\textsuperscript{19} “Second Death of Heat Dies Here Last Eve,” 1:4.
\textsuperscript{20} The first death due to heat was Raymond R. Hopeland, who died in Las Vegas on June 25, 1931.
\textsuperscript{22} The schedules shifted to 4 a.m. until noon and 4 p.m. until midnight (working with searchlights) because they could not afford losing any more workers to the afternoon heat. See King, \textit{Hoover Dam and Boulder City, 1931-1936: A Discussion Among Some Who Were There}, 4.
\textsuperscript{23} Ibid, 4.
pneumonia cases, with at least four dying from the former and five from the latter.\textsuperscript{24}

During the first year of construction, forty-six workers and family members died on or near the dam site. Since most of the deaths were documented by Six Companies and the Bureau of Reclamation as “accidents sustained on and off duty” as well as “heat prostration” and “natural causes,” it is difficult to determine the actual cause of death.\textsuperscript{25}

Of course, the men and women who toiled on the Boulder Canyon Project contended with a variety of other hazards besides heat. According to a 1932 Six Companies physical exam report, 100 patients out of approximately 3,000 employees received medical attention at either the Boulder City Hospital or the two first aid stations per day. More than 5,200 injuries occurred during this period of construction, with an average of four to sixteen accidents daily that required a physician’s help. The report also calculated that a fatal industrial injury occurred every 13,620 hours worked.\textsuperscript{26}

Initially, the contractor went through the motions of promoting safety; it posted “safety first” signs and held weekly first aid classes that provided instruction as well as distributing safety helmets, belts, goggles, and protective mechanical devices to workers. But, Six Companies was more concerned with the rhetoric of safety.\textsuperscript{27} For example, although contractor distributed helmets, they did little to enforce or require its use. Consequently, error was the leading cause of death. Human failures in operating machinery and equipment, the occasional falling rock or cave-in, as well as fatigue, lack of


\textsuperscript{25} Six Companies Inc., “Summary of Fatalities by Employers – Boulder Canyon Project – To and including July 31, 1935.”

\textsuperscript{26} Six Companies Inc., “Boulder Canyon Project Employee Physical Exams, 1932.” Garnett, Box 66, ff.1, Special Collections, Boulder City Museum and Historical Society.

\textsuperscript{27} See King, \textit{Hoover Dam and Boulder City, 1931-1936: A Discussion Among Some Who Were There}, Oral History Program, 30.
sleep, poor communication, lack of experience, or inadequate risk perception caused most injuries and deaths.

Besides these factors, workers also confronted physical threats, pollution, and disease outbreaks. As noted, the extreme desert climate, most notably the heat, was the most pressing cause of serious ailments. In addition, constructing the diversion tunnels exposed workers to indoor threats. Before dam construction began, workers diverted the Colorado River around the construction site. While carving the diversion tunnels out of the mountainside, blasting and falling rocks threatened their safety. Additionally, workers were exposed to indoor air pollutants, most notably carbon monoxide.\textsuperscript{28} While few cases resulted from lead poisoning and silicosis, carbon monoxide posed a serious and lethal threat.\textsuperscript{29} As gasoline-fueled trucks transported rocks and gravel from the tunnels, their exhaust emitted dangerous levels of carbon monoxide. Ultimately, high concentrations of gas accumulated in the tunnels because of poor ventilation. Since carbon monoxide is clear, odorless, and tasteless, the workers were unable to detect its existence. Although long-term exposure only produced mild symptoms for some workers, it had lasting neurological effects for others.

At the same time, minor outbreaks also afflicted the project. From September 1931 to February 1932, for instance, Boulder City and Las Vegas experienced a spinal meningitis outbreak. Even though the Las Vegas board of education and Boulder City closed schools for ten days to quarantine the disease, Las Vegas city health officers

\textsuperscript{28} Carbon monoxide is harmful when breathed because it displaces oxygen within the blood, depriving the heart, brain, and other vital organs. Its symptoms resemble pneumonia and the flu, and exposure can cause impaired vision, reduced brain activity, and even death.

\textsuperscript{29} Silicosis and lead poisoning are common industrial diseases associated with mining. Silicosis is a fatal lung disease caused by an overexposure to crystalline silica, a major component in sand, mineral ores, and rock. Exposure to silica dust causes scar tissue to form the lungs and reduces the patient’s ability to breathe. Lead poisoning is caused by lead dust, a highly toxic substance common in most industries. After exposure, lead effects increases blood pressure and cause nerve disorders, muscle and joint pain, infertility, and death.
referred to the disease outbreak as “not of the epidemic type.” At least one worker and three children died of complications of spinal meningitis during the outbreak.31 In fall 1933, an outbreak of the flu affected over a thousand Boulder City residents; in the next year, scarlet fever and measles debilitated the community.32 Numerous cases of typhoid fever, scarlet fever, polio, tuberculosis, measles, mumps, gonorrhea, diphtheria, influenza, whooping cough, chicken pox, bronchitis, and syphilis also threatened the population intermittently over the next few years. Airborne disease certainly contributed to these epidemics as did contaminants in the municipal water supply and pollutants spawned by the generally unsanitary conditions of the project.33 A small percentage of workers also contacted venereal diseases from their relationships with prostitutes on Block 16 in Las Vegas, forcing Las Vegas city health officers to administer the workers and prostitutes alike with shots of arsphenamine for syphilis prevention.34

Occupational health problems on the dam site were inevitable, especially in the first year. By starting the project six months early, Six Companies were not equipped to provide adequate housing, sanitary facilities, and proper medical care. To rectify this, the contractor announced plans to build a hospital for Boulder City on May 21, 1931.35

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34 In an oral history, Thomas Wilson stated that instead of the arsphenamine shots, prostitutes were administered distilled water shots from Las Vegas health officials. This affirms that even through prostitution was legal in Nevada and very popular among the men, the prostitutes were exploited and considered social outcasts. See Dunbar and McBride, Building Hoover Dam: An Oral History of the Great Depression, 242.
concept of industry-funded medical care was not a new one. Several companies had offered informal assistance to their employees prior to the twentieth century, developing health care plans that placed physicians on the company payroll. As the occupational health movement gained momentum in the Progressive Era, corporations began hiring teams of doctors after realizing how a healthier workforce boosted production and how occupational healthcare protected firms from workers’ compensation and liability lawsuits. Big firms started the trend and smaller employers followed. Increasingly, company physicians screened employees to determine appropriate jobs for their body types and excluded applicants with physical impairments. The physicals documented preexisting ailments and the overall health of an employee as well, a practice that proved useful in compensation hearings. Six Companies required their workers to sign a disclaimer relinquishing their right to sue their employer for the compensation of preexisting conditions. The disclaimer was directed at the Nevada Industrial Commission in Carson City, and the Industrial Commission of Arizona in Phoenix, stating:

“The undersigned in accepting with Six Companies Inc. admits that he is suffering from [blank] which defect was not caused during the course of employment with Six Companies. In consideration of employment by Six Companies Inc. notwithstanding physical condition, the undersigned hereby releases and forever discharges the Six Companies Inc. from any and all liability for payment for compensation and/or medical and hospital expenses that may be incurred as the result of [blank].”

Although these exams could have helped diagnose occupational diseases, physicians were loyal to their employer and rarely reported their findings to their colleagues or medical journals. Even though companies hired physicians to safeguard

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36 These occupational healthcare initiatives remained confined to larger iron, steel, and lumber firms, as well as mining companies with employees working in remote locations without private hospitals and physicians. See Sellars, Hazards on the Job, 29.
37 For an original copy of the disclaimer, please refer to the Special Collections, Boulder City Museum and Historical Society.
employee health, the physicians also played other roles, serving as consultants on increasing production, concealing potentially harmful industrial hygiene issues, and reducing workman’s compensation obligations. As a result, employees over time began to distrust company physicians.38

The medical care offered by Six Companies reflected the preexisting form of occupational healthcare; the difference was that the contractor not only provided company physicians, limited care, physical/exams, and first aid stations, but eventually a hospital on November 15, 1931. Doctors administered physicals and staffed first aid stations, but on-site medical care was not available for workers and their families in the summer of 1931. However, the contractor did establish a rudimentary medical facility in Boulder City on May 22, 1931, in a building formerly occupied by Superintendent Frank Crowe. Dr. Charles Christal, formerly the medical director for the California State Compensation Insurance fund, was placed in charge. Although Dr. Christal referred to the exam room as a “first class aid station,” his assistants routinely told patients seeking treatment that their only job was to examine them to “see if they can do a day’s work before we give them a job.”39 The physicians never saw women or children. Six Companies also bought two ambulances to transport seriously injured workers to Las Vegas.40 The ambulance ride was not even complimentary; the contractor covered insurance for treatment at the Las Vegas Hospital Association by deducting from workers’ paychecks to cover the ambulance ride and all medical costs.41 The ambulance transported patients to Las Vegas Hospital, a

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38 See Sellars, Hazards on the Job, for a detailed account of the evolution of occupational healthcare from 1880s to 1930s.
39 King, Hoover Dam and Boulder City, 1931-1936: A Discussion Among Some Who Were There, 5.
41 “Here Are the Conditions Under Which Boulder City Hospital Aid Available,” Las Vegas Evening Review-Journal, November 17, 1931, 4:3.
well-equipped facility with about 35-40 beds. Drs. Roy Martin and John McDaniel
preformed surgeries such as hysterectomies, gall bladders, and removal of thyroid glands.
Dr. McDaniel also conducted pre-employment health examinations for Six Companies for
$250.00 per month. Although the facility was adequate, the most serious cases were often
sent to Los Angeles. As an added inconvenience, patients also had to travel to Las Vegas
to fill their prescriptions at White Cross Drug. Of course, first aid stations were available
at the dam site to treat injured workers, especially the “tunnel men” who worked near
compressor number three. These stations were run by Six Companies. In fact, the
attendant in charge of the first aid station for “tunnel men,” Rosario Levesque, worked for
the Six Companies’ insurance department.

According After Williamsville temporarily closed in August 1931 because of strike agitation,
it became clear to Bureau of Reclamation officials that the temporary housing and medical
care provided was inadequate. The first indication that occupational health was becoming
a priority came when the agency ordered Williamsville to close permanently in 1932
because of its unhealthy environment. Although federal regulation of industrial hygiene
was largely spasmodic before the New Deal, that was not true of the Boulder Canyon
Project. The Bureau of Reclamation not only required Six Companies to build a hospital,

43 Erma Godbey, the wife of a worker living in Williamsville, filled many prescriptions in Las Vegas and
gave then away to the many badly burnt workers and family members at the dam site. Ibid., 5.
45 There were several other reasons why the Bureau of Reclamation and Six Companies wanted dam workers
to move to Boulder City. The city served as a form of social control because of the potential radicalism that
breeds in unsupervised camps, as seen in the IWW strike in 1931. See King, Hoover Dam and Boulder City,
1931-1936: A Discussion Among Some Who Were There, 4-5.
but also to construct a sanitary community by drafting a city plan that implemented federal recommendations pertaining to the water supply, waste disposal, and public health.\textsuperscript{46}

The workforce grew larger, as previously unemployed men not only built Hoover Dam, but also Boulder City’s sewers, sewage treatment facilities, and water purification plants. The Bureau of Reclamation ordered the construction of a pumping, filtration, and distribution system to divert and purify the muddy waters of the Colorado River for use in Boulder City.\textsuperscript{47} Completed in 1932, the sanitation system pumped two million gallons of water to Boulder City. Water analysts rigidly monitored the bacterial and chemical levels to maintain drinking water supplies. At the same time, Six Companies also erected a sludge digestion sewage plant to chemically treat the disposal of a half million gallons of waste daily, which Las Vegans used as fertilizer for their lawns.\textsuperscript{48}

Federal officials were also concerned with safeguarding food consumption. By 1932, regular inspections by the Bureau of Reclamation occurred at all establishments on the Boulder City reservation that sold, handled, or served food and drinks. The government also inspected bathrooms and toilets in houses, and public facilities. Finally, the Anderson Brothers Supply Company developed a state-of-the-art system for transporting milk through the desert from Logandale in refrigerated trucks. They even equipped their ranch with a water and sewage system, refrigeration plant, and steam

\textsuperscript{46} Eventually, President Franklin D. Roosevelt’s New Deal brought upon changes to the PHS, allocating money to state and local departments to improve health conditions, sanitary engineering, tuberculosis control, laboratory research, and mental hygiene. However, in 1931, the PHS did not have enough funds to build a hospital for Boulder City and could not be as active in the project.


\textsuperscript{48} Wilbur, “Boulder City: A Survey of its legal background, its City Plan and its Administration.”
plant. No cases of milk-borne infections occurred in Boulder City, with the exception of one case of typhoid that authorities traced to the homemade butter brought in by an Idaho family. Clearly, the sanitary practices pushed by Bureau of Reclamation officials in Boulder City greatly improved conditions on the project and symbolized the growing federal role in safeguarding occupational health in the early 1930s.

Besides the sanitary standards, the Bureau of Reclamation also required the contractor to erect a hospital. Six Companies had to build a hospital because the PHS, decimated by budget cuts, could not afford the expenditure. The modern facility opened on November 15, 1931, equipped with portable X-Ray and fluoroscopic units, diathermy, infrared and mercury quartz lamps, a laboratory to process blood and urine tests, and housed a pharmacy. According to the *Las Vegas Evening Review-Journal*, it was “as well equipped as hospitals in a large city,” with twenty beds, a special orthopedic ward, and an eight-bed isolation hospital called the “Pest House,” located on the city’s edge for contagious diseases. Headed by Dr. Christal and two other doctors J.B. Williams and Herbert L. Hercher. Dr. Wales Haas of Elko replaced Christal as head physician in 1932, and Dr. Richard Schofield succeeded Haas after his death in 1933. By 1936, the hospital had grown into a sixty-bed facility with a chief surgeon, four assistant surgeons, ten nurses, four orderlies, a radiographer who also worked as a pharmacist, and hospital management.

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51 Ibid., 91.
52 A wing was added to the hospital in 1933 to serve as an isolation ward and the Pest House was torn down. See McBride, *In the Beginning: A History of Boulder City, Nevada*, 36-39, and Wilber, *Boulder City: A Survey of its legal background, its City Plan and its Administration*.
53 Dr. Christal was a graduate of the Royal College of Surgery and the Royal College of Physicians, Dublin, Ireland. He did post-graduate work in several large industrial clinics in Europe. Drs. Williams and Hercher were both physicians in southern California. See “Equipment Put in For Opening Of New $50,000.00 Plant of Sunday” *Las Vegas Evening Review-Journal*, November 14, 1931, 5:1-2.
including a full-time auditor, office secretary, and one chef. The Boulder City Hospital and the project’s healthcare system served as a prototype for future industrial healthcare programs. Henry J. Kaiser, a contractor in Six Companies and founder of Kaiser Permanente, admired the Project’s medical facilities and coverage so much that he modeled similar establishments after it under Kaiser Permanente. The difference was that much of the program at Boulder City was limited to dam employees. Families and government officials could not use the hospital facilities, although there were several instances where the hospital broke company rules and treated outside patients. Kaiser’s later programs would include families, too.

By 1931, Six Companies not only provided a hospital for its workers but also health insurance, deducting a $1.50 monthly premium from paychecks. To be sure, the coverage was hardly comprehensive and did not cover health care at other hospitals. Moreover, like many employee insurance policies of the time, it did not cover mental or venereal diseases, “disorders arisen from pregnancy,” female “disorders,” injury and sicknesses from alcohol, drug additions, attempted suicide, fights, pyorrhea, chronic conditions, tuberculosis, preexisting conditions, or sickness arising from infections or infections or

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54 Wilbur, “Boulder City: A Survey of its legal background, its City Plan and its Administration.”
56 Please note that the Six Companies medical insurance and Boulder City Hospital did not cover or see families for medical care. They were supposed to go to Las Vegas to be treated. See “Hospital Permit Pleas for Dam City Are Asked” *Las Vegas Evening Review-Journal*, June 5, 1931, 1:5, and "Suicide Attempt Hinted in Plunge of Boulder Woman." *Las Vegas Age*, Friday, August 19, 1932, 3:1-2.
57 A copy of an original pay stub with the insurance deduction is digitally available at Special Collections, Boulder City Museum and Historical Society. Six Companies matched the $1.50 sum with $1.00, totaling $2.50 per month paid by Six Companies to the hospital fund. Six Companies continued this insurance policy after employees started treatment at the Boulder City Hospital. See Schofield, “Industrial Medicine in Nevada: As Practiced in the Construction of Boulder Dam,” 91.
contagious diseases contracted within the first seventy-two hours of employment.\textsuperscript{58} The policy covered only the workplace. Moreover, while this coverage helped and maintained the worker’s health, it also proved beneficial to the employer in workers’ compensation and employer liability suits. In short, Six Companies’ health insurance provisions demonstrated the company’s commitment to offering its employees just enough coverage to keep federal regulators off the contractor’s back.

Nevertheless, despite these shortcomings, the effects of the contractor’s health efforts were significant and even helped advance medical research. Boulder City’s hospital and sanitary/housing conditions stimulated academic interest in the project. Since heat felled so many dam workers in summer 1931, a research team from Harvard’s Fatigue Laboratory traveled to Boulder City to study the “qualitative relationship between physical performance, heart rate, and external temperature.”\textsuperscript{59} The researchers, including David W. Dill, later of the Desert Research Institute (DRI) in Las Vegas, conducted experiments on employees and dogs with the aid of the Bureau of Reclamation and Six Companies. They observed the worker’s “process of selection and adaptation” to the desert climate, concluding that an “industrial hazard is created by the association of hard work, high external temperatures, and profuse sweating.” The first three-days of work was a crucial period for workers; workers with physical deficiencies and poor mental stamina usually

\textsuperscript{58} Out of the $1.50 charged the employees each month, $.50 went to industrial medical; this covers all industrial medical in accordance to the terms and condition of statutes in Nevada and Arizona, and $1.00 to non-industrial medical. This covered the medical attention of employees and not their families. See “Here Are The Conditions Under Which Boulder City Hospital Aid Available” \textit{Las Vegas Evening Review-Journal}, November 17, 1931, 4:3.

\textsuperscript{59} Previous studies by the research team included a study of tropical heat in Panama Canal Zone and Leadville, Colorado, finding a reduction of efficiency at 10,000 feet. The studies tested working conditions, working in heat and humidity, and working at high altitudes. After the Boulder Canyon Project study, the researchers studied extreme cold in either the Artic or Anarchic in order to complete their study of extreme conditions. See “Boulder Chosen for Science Work,” \textit{Las Vegas Evening Review-Journal}, February 4, 1932, 2:1-3.
quit, and the ones who survived usually continued indefinitely. Their cardiovascular systems were able to withstand the effects of working at high temperatures. \(^{60}\) After the researchers’ arrival, Dr. Cornelius Van Zwalenburg, a medic at the dam site, discovered that administering salt supplements to worker’s prevented heat exhaustion. \(^{61}\) The researchers ultimately found that heat exhaustion and stroke occurred not because of lost body fluids, but because of the loss of salt excreted in sweat. They concluded that an imbalance of sodium and potassium in the blood stream and body tissues caused the heat exhaustion that triggered approximately 150 hospitalizations and 17 deaths in 1931.

Over the next decade, these findings would go far toward protecting Hoover Dam workers as well as their counterparts toiling on outdoor projects across the nation. Even though the idea of administering salt supplements may have not been unique to the project, the transmission of the Harvard research team’s findings to the medical and industrial hygiene community was. The researchers published their findings in medical and scientific journals, including *American Journal of Tropical Study* and the *Journal of Clinical Investigation*, which disseminated healthcare protocol to other industrial projects. Six Companies immediately enacted policy changes after learning the findings. Workers were advised to be partially acclimated into the heat and consume a half tablespoon of salt daily in addition to their usual food intake. The Anderson Brothers Supply Company also added extra salt to the food and Six Companies placed salt dispensers around the dam site. Physicians also urged employees to drink the cool, sanitized water from the contractor’s water system throughout the day. \(^{62}\) As a result, fewer deaths and hospitalizations occurred

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\(^{62}\) Schofield, “Industrial Medicine in Nevada: As Practiced in the Construction of Boulder Dam,” 89.
from June-October, 1932. Although the greatly improved living conditions, sanitized, cool drinking water, and acclamation to the desert climate were crucial to the reduction of heat-related illnesses, the primary reason for fewer deaths were the milder summer temperatures in 1932. 63 A smaller turnover rate also made it possible to retain workers who were in good cardiovascular shape and acclimated to the environment. It is noteworthy that despite the initial apathy of Six Companies to occupational health, the Boulder Canyon Project managed, through scientific research, medical expertise, and federal government and private support, to improve industrial hygiene conditions within a year.

After Franklin D. Roosevelt became president in early 1933, the New Deal brought other advances in occupational health to the project. 64 Under the direction of Francis Perkins, Roosevelt’s newly appointed director of the Department of Labor, officials evaluated safety at Hoover Dam. 65 Their findings reflected what was generally known about conditions at the dam site: little use had been made of organized accident prevention, investigation, and analysis as well as effective safety programs that enlisted the foremen and laborers. The report recommended that the contractor keep detailed reports and investigate all major disabling accidents, appoint a full-time “Safety Engineer,” use standard educational methods in safety to facilitate cooperation among the workforce, and to enforce the eight-hour law to avoid dangerous overtime. Although the report found that death and accident rates were considerably higher than justified by the nature of work, it noted that no major catastrophes or serious failures occurred because of the safety

63Talbott, Edways, Dill, and Rastich, “Physiological Responses to High Environmental Temperature.”
64 Established by Franklin D. Roosevelt, the New Deal refers to the legislative agenda that created the federally backed social programs, social reform, and policies designed to pull the United States out of depression.
measures that Six Companies undertook prior to 1935. Ultimately, New Deal regulation fixed the project’s remaining safety issues and created a legal environment that favored the employee, not the employer, in workers’ compensation and employee liability suits.

Although the labor force benefited from state workers’ compensation and the employee liability suits, most lawsuits against Six Companies met limited success until 1935-1936. Both Nevada and Arizona provided workers’ compensation to Six Companies employees. The Arizona Industrial Commission employed a full time inspector to make safety inspections as well as represent the state in compensation matters.66 There was no Nevada state investigator until the DOL recommended that the state provide one in 1935. By 1934, Nevada and Arizona settled numerous minor compensation cases, typically with Arizona compensating with higher premiums than Nevada. Nevada paid after seven days of the accident, depending on the seriousness of the injury, and Arizona, fifteen.67 Six Companies, which contributed to the Nevada State Fund and self-insured Arizona fund, was concerned about the difference in figures and its lawyers tried to reduce the amount paid to Arizona causalities and their dependents. The contractor’s Board of Directors first discussed this issue at a San Francisco meeting in 1931, and concluded that “only single men shall be employed in Arizona.”68 However, Six Companies failed to pressure their workers into reporting injuries sustained on the Nevada side of Black Canyon; most men conveniently experienced their injuries on the Arizona side. Many of the workers committed insurance fraud. Six Companies’ Arizona compensation costs soared because most men manipulated their accidents to be “officially” in Arizona. Collusion was rampant as workers frequently dragged their colleagues’ injured bodies from Nevada to

66 Williams, “Safety at the Boulder Dam,” 12.
68 Six Companies Corporate Records, “Minutes of Board of Directors,” August 15, 1931.
Arizona. Eventually, state officials recognized the ploy and sometimes refused to approve payments, forcing workers to contest the decision in court.

On a related front, dam workers began to extend the range of employer liability in the once hostile courts, using carbon monoxide cases to establish a beachhead. As early as 1916, the PHS warned American industries about the dangers of carbon monoxide in the workplace and published guidelines to limit emissions. Several studies also confirmed that the cumulative effect of small doses of carbon monoxide killed or seriously injured humans. In 1921, Yale University’s Yendell Henderson even carried out scientific experiments in a chamber that gassed human volunteers to study the affects. By 1931, carbon monoxide was an easily identifiable cause of death, a fact that immediately put Six Companies on the defensive. Even though a Nevada Mining Law prohibited the operation of gasoline-powered motor vehicles underground, Six Companies operated large trucks to haul rock out of the diversion tunnels. The trucks emitted a dangerous amount of carbon monoxide that accumulated in the tunnels because of the poor ventilation. The contractors contended that the operation was neither prohibited by Nevada law nor detrimental to worker’s health. When the Nevada State Inspector of Mines threatened suit, Six Companies avoided court for several months until the state officially filed charges. Six Companies attorneys countered that the state lacked jurisdiction to enforce mining law

69 Some accidents sometimes never even happened on the job. Dam worker Leroy Burt indicated that a peer, Denny Greenwood, broke his leg in a fight with his brother, but went to the Arizona side to collect compensation. See Dunbar and McBride, Building Hoover Dam: An Oral History of the Great Depression, 262-264.

70 The results of these tests revealed what scientists already assumed about the effects of carbon monoxide; exposure to the gas made their human subjects seriously ill. Sellars, Hazards on the Job, 168.

71 In truth, Six Companies had a $300,000 investment in the trucks. They knew that carbon monoxide was lethal, but chose to honor their investment over the health of their workers. “Higher Bond To Be Demanded in Big Six Dam Suit,” Las Vegas Evening Review-Journal, November 18, 1931, 2:5-6.
because the dam site was subject to federal regulation.72 A federal panel eventually ruled in Six Companies’ favor, after the latter appealed a ruling that gasoline trucks could not be underground to a greater depth than 250 feet, under the terms of Nevada statutes.73 The results were disastrous. By November 1932, many workers were dead, sick, or dying from acute carbon monoxide poisoning.

Because of labor militancy on the issue, laissez-faire eventually yielded to government regulation. But the process took time. Most workers were convinced that carbon monoxide caused the respiratory problems their physicians diagnosed as “pneumonia.”74 Moreover, they suspected the physicians were concealing Six Companies liability, which created an incredible amount of bitterness between the workers and their employers. The Boulder City Hospital was a hot topic of discussion among the workers because they felt their peers were “only dying of pneumonia” and “nothing else.” It became a standard joke among the workers: “Don’t go to the Boulder City Hospital, you’ll die of pneumonia!” The IWW’s Industrial Worker publicly accused Dr. Haas of purposely diagnosing gas cases as “influenza” and listing “pneumonia” as the cause of death.75

Since employer liability was easier to prove, especially with a well-established disease like acute carbon monoxide poisoning, several exposed workers sued Six

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75 The Industrial Workers of the World, I.W.W. or the Wobblies, is a radical labor union that had its beginnings in Chicago in 1905. The organization grew out of the Western Federation of Mines and its members were all workers, skilled or unskilled, with no restrictions as to race, occupation, ethnic background, or sex. The I.W.W.’s advocated and organized many strikes and slowdowns. From 1906-1929, the Wobblies were responsible for 150 strikes, including a miners’ strike in Goldfield, Nevada, from 1906 to 1907. The I.W.W.’s lost their strength in the 1920s after federal and state repression in the 1920s and planned to organize two strikes at the Boulder Canyon Project to prove themselves as a viable union. Both attempts failed. See “Iron Heel is Used to Stifle All Squawks,” Industrial Worker, January 26, 1932 and Rocha, “The I.W.W. and the Boulder Canyon Project: The Death Throes of American Syndicalism,” 213-234.
Companies for damages. At the same time, tighter government regulations facilitated successful employer liability lawsuits. By the 1930s, cases like these inspired the emergence of a new breed of lawyer who specialized in personal injury cases. These lawyers forced courts to determine employer liability for the ailments excluded from workers’ compensation. Six Companies was not immune from this process. In 1933, for example, attorney Harry Austin filed six personal injury lawsuits against Six Companies, alleging the contractors had been negligent in protecting their workers from the carbon monoxide. The alleged victims sought $77,186 in damages for permanent ailments.76

Instead of settling out of court, Six Companies fought the allegations. The first two cases, *Ed F. Kraus v. Six Companies Inc.* and *Jack Norman v. Six Companies Inc.* resulted in hung juries after Six Companies employed unethical and illegal techniques to win their cases.77 Austin filed several more carbon monoxide-related civil suits after these losses. By August 1935, forty-eight plaintiffs sought a total amount of $4.6 million in damages and by January 1936, Six Companies accepted defeat. The case settled out of court, distributing an undisclosed amount, to fifty plaintiffs.78 The workers won a watershed victory in the occupational health movement: an employer finally compensated their employees for negligence in industrial hygiene. The carbon monoxide-related cases set a crucial precedent for future employer liability civil suits, and sent a convincing message to

77 *E.F. Kraus v. Six Companies, Inc. Frank Bryant and John Tacke*, Compliant filed in Eighth Judicial District Court of Nevada, No. 4499, April 13, 1933. *Jack F. Norman v. Six Companies, Inc*, Compliant filed in Eighth Judicial District Court of Nevada, No. 5256, May 24, 1934. Records are available at the Clark County Courthouse. MacAfee and MacAfee Papers also located at Special Collections, Nevada State Museum and Historical Society, Lorenzi Park. Six Companies hired Jim Moretti to uncover evidence to incriminate Ed Krauss, who he spent three months with. Kraus drank, gambled, and regularly had sex with a woman named Merle, which ultimately discredited his case because he claimed that carbon monoxide compromised his ability to perform sexually. Moretti’s testimony also did not paint the picture of an ailing man for the jury. In the second case against Jack Norman, Six Companies bribed at least three men on the jury to reach a verdict in their favor. See Stevens, *Hoover Dam: An American Adventure*, supra n37 at 213.
American industry that it would be cheaper in the end for employers to embrace occupational health programs.

Thus far, the occupation health advances that came at Hoover Dam have not been fully celebrated; it is excluded from the triumphalist film shown as part of the official on-site dam tour, the numerous documentaries on the dam construction, and works on American occupational health. This history is significant because the Boulder Canyon Project antedated the New Deal as did many of the occupational health initiatives pushed by the Bureau of Reclamation. In the short run, concerns triggered by the relatively unique factors that coalesced at the dam site in 1930-31 forced the Hoover Administration and Six Companies to undertake health and safety reforms that would have been rejected in earlier decades and in less torrid locations. In the long run, these actions provided vital momentum and support for advocates seeking to convince Congress, the states, the judiciary, and a growing number of employers to prioritize health and safety in the workplace. In the rapidly changing environment of the Depression Era, Six Companies gradually endorsed occupational health to enhance its corporate image, save money, appease the courts, and satisfy the federal government. In doing so, it set an example for other employers and provided a valuable precedent for labor attorneys. In later years, the New Deal would not only duplicate Hoover Dam in other western states, it would also extend the healthcare, sanitary codes, and other occupational health practices forged on the project to thousands of workplaces across the nation. This significant part of American medical history should not be absent from public memory.