Chapter Seven

Safety Inside and Outside the Fences

Was it dangerous? Against today's climate of 'guaranteed safe, predicted, nuclear operation' we would have to be judged somewhat open loop. Dick [Dr. Richard Doan] must have realized that the key to safe operation in a game still subject to surprises was to tap that insatiable desire of some people to explain even the most trivial departure from the known and understood norm.

—Marion E. Thomas—

On a fall day in 1950, a research physicist named Deslonde de Boisblanc picked up the Bartlesville, Oklahoma, morning paper and read that the AEC had chosen his employer, the Phillips Petroleum Company, to manage a classified government project. He went off to work contemplating this news with great interest.

When I reached the laboratory there was a note that I was to attend a 10:00 a.m. meeting in Dr. Doan's conference room. That meeting was unlike anything that I had ever experienced before, or have since. About thirty people, not all from the Research Division, were seated, wondering why they were there, some having guessed that it was related to the announcement, but still puzzled. At ten o'clock sharp, Doan strode into the room, went to the head of the table, and delivered what might have been the shortest briefing in history. He supposed by now everyone knew that something was going on in Idaho and that Phillips had been chosen to be part of it. He said that each of us had been selected but that until we received Secret clearances, the nature of the project couldn't be revealed. Furthermore, arrangements had been made for the lot of us to go to Oak Ridge, Tennessee, without spouses, for an accelerated course in nuclear technology as well as specialized training tailored to our individual assignments.[1]

Bonneville Museum - Bonneville County Historical Society, March 1963, *Philtron*

Dr. Richard Doan

Others of the chosen group were on field trips, and to these Doan placed phone calls and said, "I've got news for you. You're going to Idaho." They soon learned that their mission was to run the MTR reactor.[2]

Doan, a man apt to be seen in his off-hours wearing blue jeans, western-style shirts with scalloped pockets, and a ten-gallon hat pushed back on his head, told

A portal personnel radiation monitor. Detector searches from head to foot. "Counting" equipment is overhead and alarms if count exceeds background level of radiation. Employees were monitored upon entering and leaving work areas.

U.S. Department of Energy 74-10537 Photo for AEC by Milt Holmes his group that housing for them and their families might be a problem, although an Idaho Falls developer was building a subdivision that would contain enough affordable homes for each of them.[3]

Despite their unfamiliarity with Idaho, the mystery about the project, and the promised difficulty with housing, no one whom Doan beckoned chose to decline. To a man, they trooped to Oak Ridge, where they slept in barracks by night and hovered around a mock-up of the MTR by day. Architects from Idaho Falls came to consult each man about the kind of house his family would need. When they got to Idaho Falls, the city gave them its usual warm welcome, printing their names in the paper along with necessary social data about club memberships and street of residence.[4]

Richard Doan, a fully matured scientist and administrator at fifty-two years old, arrived early in January 1951. Born and raised in Indiana by a family with Quaker roots, he taught high school and college physics while earning a doctorate at the University of Chicago. It was the right place to be for a young physicist in the 1930s. He worked with Dr. Arthur Holly Compton on X-ray and cosmic ray research. Doan built, calibrated, and tested cosmic-ray meters destined for Peru, Greenland, and other exotic places around the globe. He made his reputation as a scientist by developing useful methods of measuring X-ray wavelengths. In 1936 he went to work for Phillips' research division.[5]

Idaho State Historical Society/INEEL 57-1216

Ponderosa Drive, Idaho Falls. New subdivisions around Idaho Falls kept pace with the growth in employment at the NRTS.

Compton, a Nobel laureate, was a member of the Manhattan Project's S-1 Committee, the group that guided the program. When Compton organized the secret Metallurgical Laboratory in Chicago, he asked Doan to leave Oklahoma and direct the lab. One of Doan's unique managerial duties was to hunt for any pure uranium that might be found in the industrial closets of the country, a pursuit that was said to have turned his hair gray. In 1943 he moved to Oak Ridge to direct the scientists developing the Hanford plutonium-separation process.[6]

After the war, Doan returned to Phillips and became director of research over the company's work on geophysics, hydrocarbon conversion, chemicals, and rubber. Phillips aimed to be a new-products leader in the energy industry, which in the early 1950s meant getting a foothold in nuclear energy. When Phillips bid for the AEC contract to operate the MTR—one of thirty-four firms to do so—Doan was, perhaps, the single most important asset in Phillips' package. The company expected to benefit from the broad exposure and invaluable training the experience would provide its scientists.[7]

Once in Idaho, Doan proceeded to set the standards for test-reactor operations and Phillips' employees. If Bill Johnston had invented the testing station, Doan transformed it into a genuine scientific laboratory. Running reactors was still a profoundly new and potentially dangerous enterprise, and Doan felt that safety had to be institutionalized at every level. He insisted that engineers and physicists be on-line at the MTR twenty-four hours a day. Excellence in every part of the operation, he felt, was the only sure way to safety.[8]

Doan's interest in safety, combined with his status as a Manhattan District alumnus and wide-ranging connections in the AEC and industry, led to new projects and new missions. Many of them had to do with reactor safety, but others were in the realm of pure research. He set the NRTS on a trajectory of growth far beyond the AEC's original vision for the place.[9]

Doan, sometimes referred to as "Pappy" by employees, had acquired a certain charm and a talent for persuasion, but that veneer was rarely mistaken for softness. He was willing to be unpopular for his decisions, and this quality made him seem either "aloof" or "tough, but fair." He understood the tension between logical scientific development and the role of individual initiative. Eventually he had over 2,000 people working for him. He had to balance the practical facts of business with the unbusiness-like fact that virtually everything the 2,000 people were doing had never been done before.[10]

Doan insisted that Phillips employees integrate themselves into the communities in which they lived. He bought a house as soon as he could and joined the Presbyterian Church, the Kiwanis Club, the Idaho Falls Chamber of Commerce, the country club, and civic life in general. He expected other Phillips people to follow his example.

Equally, Doan committed himself to the Phillips corporate culture, which regarded every employee as part of the far-flung Phillips "family." The company practiced a brand of welfare capitalism it had inherited from its founder, Frank Phillips. In addition to pension, health care, and education benefits, the company sponsored intramural athletic teams, company picnics, a monthly magazine promoting *esprit d'corps*, and memberships in athletic and self-improvement clubs called the Frank Phillips Men's Club and the Jane Phillips Sorority for women, Jane having been the founder's wife.[11]

A Phillips Woman

My secretarial career began with Phillips Petroleum Company the summer of 1960. All new secretaries were trained at Central Facilities as a group, learning the "Phillips" procedures of office work.

My first permanent assignment was in the Project Engineering Department of the MTR reactor project. The facility was housed in an abandoned temporary construction barracks covered with tar paper, thus its nickname, the Tarpaper Palace. Temperatures rose to well over a hundred degrees in the summer, and winter found us freezing in this single-walled structure using only tar paper to cover the cracks. The Palace was the farthest distance from the guard house/bus stop. Foot travel was over gravel roads and through the MTR reactor building. The dress code for female workers was dresses, heels, and hose. This made the walk doubly hard. The wind blew mightily on the desert, and since full skirts and crinolines were the style, many of us would wrap masking tape around the bottom of our skirts to keep them down when walking out-of-doors between buildings.

Pregnant women were not allowed to work near the reactor areas because of the radiation. When a woman reported she was pregnant, termination occurred the same day.

The Jane Phillips Sorority was a women's group named after the wife of the founder of Phillips Petroleum Company. Monthly business/social meetings were held at the Bonneville Hotel in Idaho Falls. Yearly convention meetings were held throughout the country, two of which I attended as a delegate. One trip was by bus to Odessa, Texas, and the other was by car to Bartlesville, Oklahoma, the home office of Phillips. Because the company helped to finance these trips, we stopped at Phillips gas stations and charged our gas to Phillips credit cards. These conventions were to educate us on company history and progress as well as provide helpful training. We returned to our jobs with enthusiasm and more enlightened.

Myrna Perry

A Jane Phillips Society social.

Bonneville Museum - Bonneville County Historical Society, Dec. 1956, *Philtron*

One method that Phillips used to promote a family feeling among employees was to sponsor intramural athletic competitions. The August 1960 issue of the *Phillips Philtron* reports the current progress of the teams.

NRTS Intramural Softball League Standings as of August 1960

	Won	Lost	Pct.
MTR Robins	10	1	.910
CF Canaries	8	3	.728
MTR Pelicans	6	5	.700
CPP Eagles	6	5	.546
ETR Seagulls	4	6	.400
SPERT Bluejays	3	7	.300
Hdqrts. Cardinals	3	7	.222
CPP Orioles	1	9	.100

As the contractor for the MTR, Phillips was responsible for hazard management and safety operations within the fence of the MTR complex. Outside the fence, the IDO took over. Bill Johnston had decided early that safety outside the contractor fences would be a direct IDO responsibility. Safety, assigned to the Health and Safety Branch, was a broad concept and included employee health, operational safety, radiological protection, and environmental protection.

One of the first tasks of the Health and Safety Branch was to discover the pre-reactor level of background radioactivity in the Site's environment. The operation of reactors and the Chem Plant would certainly release radioactivity into the air, soil, and water. It was necessary to survey the desert before the first reactor went critical and establish a baseline for future comparisons. The Branch asked biophysicists and biologists from Hanford, who had done a similar survey at that site, for help.[12]

A team from Hanford's Radiological Sciences Department went to the Rogers Hotel in May 1950 to work out the details of the survey. As yet, the NRTS had no laboratories, so samples had to go to Hanford for analysis. In the next few months, a truck was sent from Idaho to Hanford every two weeks loaded with tapes of data, vials of water, and cardboard ice-cream cartons filled with plant and animal samples.

The scientists in charge handed several students from Idaho State College at Pocatello excellent summer jobs collecting samples and classifying plant and animal species populating the site. They adapted one of the Navy's white clapboard houses as a field station, and students were seen all summer entering with armloads of sagebrush and other plants. The little kitchen now contained autoclaves and other lab-like gadgetry used to prepare samples. The refrigerator held packets of animal parts awaiting the next truck to Hanford.

The samples came from 107 plots of ground, staked at intervals of a quarter of a mile in two perpendicular transects across the testing station. In the kitchen, the students weighed out a twenty-gram specimen of each plant, put it into a fresh carton, daubed it with a drop or two of formaldehyde, and labeled the carton. Elsewhere in the house were stores of air filters, air-monitoring equipment, X-ray film, and instruments to record the amount of radiation in the air.

With the help of IDO and USGS employees, samples came from locations far beyond the boundaries of the testing station. Air samples came from Dubois, sixty miles away, as well as from the EBR- and MTR- construction sites. Water samples came from every well at the Site and from wells in Pocatello, Blackfoot, Atomic City, and Idaho Falls; from wells at farm homes between the Site and the Snake River; and from the Thousand Springs gushing from vertical lava-rock walls into the Snake River Canyon down-gradient more than a hundred miles away.

The Hanford laboratories counted and dissected and measured. Sampling continued from May to November because of the cyclic presence of some isotopes. The findings were published in a report much consulted in succeeding years.[13]

The first increase in the level of background radiation at the Site came not from NRTS experiments but from the detonations of nuclear weapon tests at the AEC's new Nevada Test Site in 1951. The NRTS and other air monitoring stations in southern Idaho detected the fallout from these tests. One secret Nevada test generated readings so high at the Idaho Falls airport that an airport official, as yet unaware of the test, decided that the detection equipment was malfunctioning. On another occasion, a truck loaded with spent fuel from Hanford was headed for the NRTS and passed through a rainstorm between Boise and Twin Falls. The rain washed radioactive particulates out of the fallout cloud and contaminated the truck. The truck arrived at the NRTS with a detectable radiation field on all of its exterior surfaces, up to 10 millirem per hour in spots. It took some time before the puzzled analysts figured out what had occurred.[14]

The AEC kept the tests secret in an effort to deceive the USSR, whose physicists, it was feared, could learn the size and other features of a detonation from the fallout that reached its own atmosphere. If the AEC had made public announcements before the tests, it would have made Soviet work easier. But by keeping the secret from the NRTS as well, it presented the Site's environmental monitoring personnel with similar challenges.

The IDO continued an active program of sampling, regularly testing the air (using film badges located on perimeter fences and other areas), on- and off-site wells, dairy milk from cows at nearby farms, and tissue from trapped or road-killed jack rabbits and other animals on the Site. After 1959 the IDO distributed quarterly tabulations of the monitoring results to the press, the Idaho Department of Health, and members of the Idaho congressional delegation.[15]

Questions of safety interested nearby towns as well, and southeast Idaho news reporters covered the story of the background radiation survey with great interest. Reporters wrote several articles about radioactivity, teaching themselves and their readers how to understand the special hazards associated with "atom work," and the difference between alpha, beta, and gamma radiation. They described various methods of shielding and how remote-controlled devices manipulated hazardous materials while the operator stood behind thick panels of leaded glass.[16]

Reporters described the job of the health physicist (HP), who regularly measured the doses of radiation each worker received. The HPs issued everyone a small ionization chamber resembling a pen that was carried in a shirt pocket. Together with a badge lined with special film, the HP could determine and record the radiation each employee had been exposed to in a day, a week, a quarter, or a year. The AEC issued regulations providing maximum exposure limits for given periods of time, and each contractor was obligated to protect its workers and its safety record accordingly. In 1955 the National Committee on Radiation Protection, whose advice guided the AEC, adopted exposure standards for the general public for the first time. These were an arbitrary ten percent of the permissible occupational exposure level. The IDO philosophy was that the NRTS was not engaged in weapons production and should operate as a model for civilian and peaceful operations, so the Site used exposure standards that were more restrictive than those permitted by the AEC. Another reason for preventing workers from exceeding exposure limits was to avoid having to transfer them to non-nuclear work, a significant administrative annoyance.[17]

The public read about emergency evacuation plans, new microwave communications technology, the use of air filters, and the large ionization cham-

IDO 21221

A house in the former residential part of the Naval Proving Ground became a field station, its kitchen a laboratory for the 1950 radiation survey.

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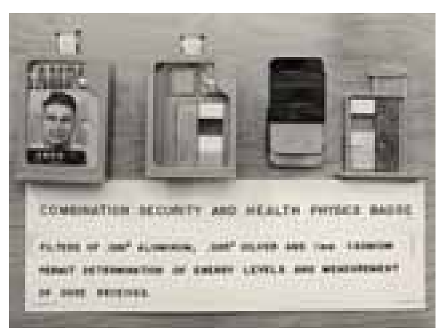
Calibration technicians check ionization chambers of a minometer. Site employees wore them in their pockets. The devices were checked daily for possible exposure to radiation.



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Film badges measured personal radiation dose levels.

People and Radioactivity

If a lump of radioactive material sits on a dish on a table, a person nearby would want to measure, first, just how radioactive is the material? and second, if the person walks or stays too near it, what "dose" of radioactivity might be received?

"Curies" measure the rate at which atoms in the lump are decaying. "Rems" measure the dose that a person might receive from exposure to it. Much depends on whether the person eats, drinks, breathes the material or simply walks past it.

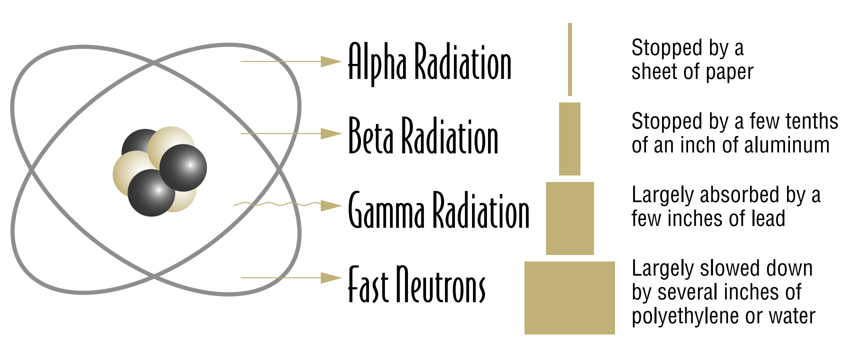
People in the United States receive an average yearly dose of radiation of 360 thousandths of a rem, or millirem. About 82 percent of it is from natural sources like radon, cosmic rays, rocks, soil, and food. Radiation has been part of the natural environment for millions of years. Many foods contain radioactive isotopes. The amount is so small that it is measured in trillionths of a curie, or picocuries.

Beer	390 pCi/liter	Whiskey	1,200 pCi/liter
Tap water	20 pCi/liter	Brazil nuts	4 pCi/gram
Milk	1,400 pCi/liter	Bananas	3 pCi/gram
Salad oil	4,900 pCi/liter	Flour	.14 pCi/gram

We receive doses from other sources:

Cigarettes, 2 packs/day	8,000 mrem/year	polonium-210
Living in Salt Lake City	46 mrem/year	cosmic radiation
Living at sea level	26 mrem/year	cosmic radiation
Dental bite-wing X-ray	2-4 mrem	
Chest X-ray	6 mrem	
U.S. Capitol Building	20 mrem/working year	granite
Base of Statue of Liberty	325 mrem/year	granite
The Vatican	800 mrem/year	granite

Source: DOE/EM-0065P and other



Penetrating power of various types of radiation.

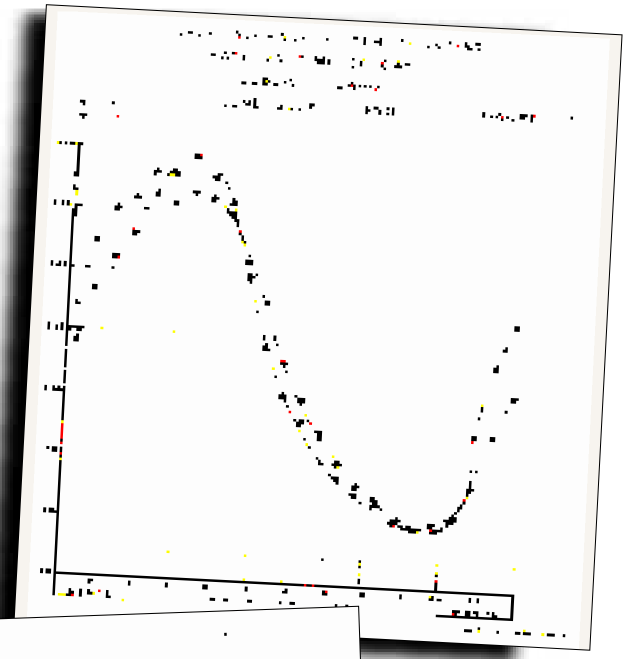
bers being set up in the region's airports to monitor radiation. In addition, the U.S. Weather Bureau, which set up a permanent weather station at the Site, was studying every breeze that blew, launching balloons and setting up permanent instrumentation. Some of the first gauges went up on the Navy's old wooden water tower, for example, and measured air movements at 75-foot and 150-foot elevations.[18]

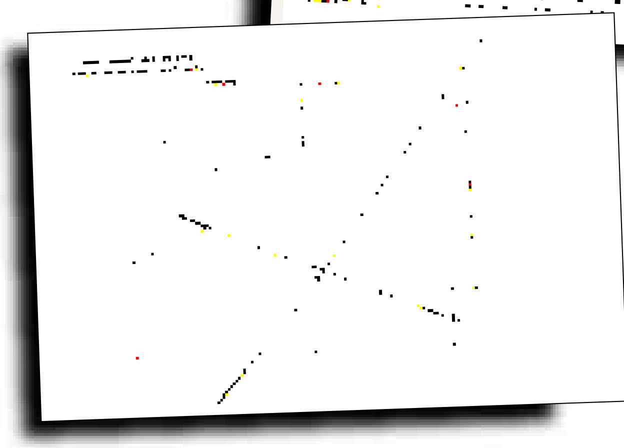
The State of Idaho also had early concerns about safety, and these had to do with construction workers. The Idaho legislature had created a Department of Labor early in 1949 with a tiny staff of three: a commissioner, a safety advisor, and an office secretary.[19]

When W.L. Robison, the first commissioner, realized the impending size of the construction program, he and his safety advisor made their own trek from Boise to the Rogers Hotel for a briefing. "After being identified by a formidable array of guards," Robison wrote later to Governor Robins, "we were ushered into Mr. Hostetter's office." Using a large map showing proposed buildings, G.M. Hostetter, chief of the IDO Safety Division, explained how the work would progress. He showed Robison where the first-aid station was located, and how it soon would be enlarged, a full-time nurse and doctor hired, and two emergency ambulances purchased. Until the road to Idaho Falls was finished, emergencies would go to the hospital in Blackfoot. One of the big dangers was lead poisoning. "All walls are to be lined with heavy sheet lead," said Robison of one project. Workers handling it would have medical examinations before they started and "proper [safe] guards" to prevent them from being poisoned. The IDO would send the state monthly reports of accidents, first-aid treatment, and hours worked.[20]

Hostetter's initial reports were good. From the start of the work to September 1950, the IDO reported 15.06 accidents per million man hours worked. This compared favorably to a national average of 36 per million hours and very favorably to an Idaho average of 70 accidents per million hours. The Site continued to break Idaho safety records. Robison reported that on July 3, 1954, Phillips employees had worked one million man-hours without any disabling injuries. This was a first in the history of Idaho, and it was duly celebrated with visiting dignitaries and ceremony a few weeks later.[21]

Johnston created an Idaho Environmental Advisory Committee to advise him on matters regarding public health. The members—who included the Idaho Director of Public Health and other state health officers, a USGS geologist, a meteorologist stationed with the U.S. Weather Bureau in Boise, the Idaho State Reclamation Engineer, and a private physician—met for the first time in March 1954. They received an introductory tour of the NRTS and the activities that potentially involved public health. Their first impressions were favorable, and after the meeting, committee members told the press that "controls enforced by the NRTS appear adequate to prevent exposure of the surrounding area to health hazards."





Graph published in radiation survey report (HW-21221) shows average daily background radiation at Dubois. Count rises in early morning and falls at night. Transect, below, shows plot locations for soil and vegetation samples.

The group met quarterly after that, usually in two-day meetings, typically reporting afterwards to the press on their commendations and critiques.[22]

Before the advent of the AEC, the State of Idaho had little reason to become interested in radioactivity. Throughout the 1950s, few hospitals in the state, if any, used radioisotopes for the treatment or detection of disease. The Idaho Department of Health's first regulations pertaining to radioactivity were adopted in 1954 when it set standards for X-ray machines used in shoe stores. A parent or sales clerk could fit a child with shoes, place the child's feet into an opening at the bottom of the machine, and then look through a viewer to see if the shoes crowded the bones. The machines became notorious for exposing children's feet to alarmingly-large doses of radiation. Through the department's educational efforts, Idaho shoe stores discontinued the use of the machines.[23]

INEEL 59-3091

The IDO ambulance in 1959, fully loaded with emergency equipment when ready to roll.

In 1955 the Idaho Department of Health was reorganized as a Board of Health, giving it more authority in watershed protection, sewage collection and disposal. Dr. Terrell O. Carver, the administrator for the Board of Health after 1958, began to promulgate the Board's policies formally, holding hearings on a spectrum of issues, including crematoria, nursing homes, water pollution, cleaning of septic tanks, and radiation protection.[24]

The Board of Health adopted radiation protection rules in August 1958 after a few industrial users elsewhere in the state accidentally spilled radioactive materials into the environment. Such users were henceforth obliged to register themselves with the Board. The brief set of rules prohibited discharging radioactive wastes to the environment without prior approval of the Board and required that the board be informed in the event of an accident. After 1961, by which time hospitals were more involved with radioactive source materials (nuclear medicine), the Idaho legislature directed the Board to establish more-comprehensive standards. That was also the year that the Board of Health purchased its first equipment for conducting a few basic types of radiological analyses.[25]

The managers of the NRTS spent the 1950s being cordial to the succeeding governors who entered and left the Statehouse. Len B. Jordan followed Robins, and after him came Robert Smylie, elected in 1954. New governors were routinely congratulated on their elections and invited to tour the Site. They presented awards and attended ceremonial functions at the NRTS. Governor Smylie in particular was an advocate of industrial safety and recognized the unprecedented safety record maintained at the NRTS. At times, the IDO and the AEC in Washington informed the governor and Dr. Carver when spent fuel was being shipped into Idaho.[26]

When Smylie created a Governor's Committee on the Use of Atomic Energy and Radiation Hazards in 1959, the IDO supplied three of its high-level staff specialists in health physics and waste disposal to serve on the committee along with his other appointees from state agencies and industries. Smylie asked the committee to examine how other states set radiation standards and then to recommend improved control measures for Idaho. With input from this committee, the Board of Health adopted a more detailed set of standards and regulations in 1964. These refined the earlier rules and exempted federal agencies and their contractors from having to register with the state. The committee discussed the states' rights issue and concluded that the state should not restrict the AEC because federal rules already governed it. According to committee minutes, the members were "not disposed to enact regulations that might discourage industrial development within this state."[27]

Although the relationship between the governor's office and the NRTS was courteous, it was also distant. The issue of waste disposal did arouse states' rights sentiments in government circles.

Dr. Carver was well aware that "underground waters" were receiving radioactive waste at the Site. He wrote in 1959 to Senator Clinton P. Anderson, the chair of the JCAE, "In our relationship with the AEC we have been led to believe that the state need not concern itself with atomic energy installations nor their operation. We think that is wrong."[28]

Governor Smylie likewise did not care for AEC policies excluding the state from a role in water pollution control. In November 1963, he said as much before a hearing by Congress' Natural Resources and Power Subcommittee of the Committee on Government Operations. He described the state's recent progress—and the role of federal funds—in reducing sewage and other wastes going into the state's waterways but then cited problems that remained. One of them was the continuing practice by the AEC and the Bureau of Reclamation of discharging wastes directly to underground water tables. These agencies, he said, operated "in opposition to state policies" and handicapped the state's efforts.[29]

Clearly, the IDO had allowed no one to doubt that federal authorities alone were responsible for operating practices and standards governing the NRTS. The State of Idaho was outside the fence.

Phillips campaigns promoted safety in construction and shop settings. Philtron *magazine published this 1957 reminder.*

Bonneville Museum - Bonneville County Historical Society, March 1957, *Philtron*