

23

Twenty-third Annual Report

**Radiation Exposures for DOE and
DOE Contractor Employees - 1990**

November 1993

*Special Topic:
New Dose Reporting Quantities*



**Prepared for:
U.S. Department of Energy**

**Assistant Secretary for
Environment, Safety and Health**

Office of Health

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TWENTY-THIRD ANNUAL REPORT

**RADIATION EXPOSURES FOR DOE AND
DOE CONTRACTOR EMPLOYEES - 1990**

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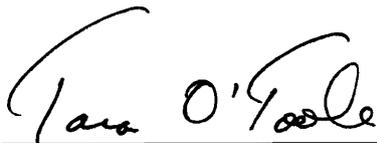
FOREWORD

This is the 23rd in a series of annual radiation exposure reports published by the Department of Energy (DOE) or its predecessors. This report summarizes the radiation exposures received by both employees and visitors at DOE and DOE contractor facilities during 1990. Trends in radiation exposures are evaluated by comparing the doses received in 1990 to those received in previous years. The significance of the doses is addressed by comparing them to the DOE limits and by correlating the doses to health risks based on risk estimated from expert groups.

This report is the third that is based on detailed exposure data for each individual monitored at a DOE facility. Prior to 1988, only summarized data from each facility were available. This report contains information on different types of radiation doses, including total effective, internal, penetrating, shallow, neutron, and extremity doses. It also contains analysis of exposures by age, sex, and occupation of the exposed individuals. This report also continues the precedent established in the Twenty-First (1988) Annual Report by conducting a detailed, one-time review and analysis of a particular topic of interest. The special topic for this report is a comparison of total effective, internal, and extremity dose equivalent values against penetrating dose equivalent values.

Several historic factors affected the timely publication of this annual report: 1) the reporting of annual dosimetry data involves a manual quality control and assurance process; and 2) there were continuing problems associated with the reporting of internal dose calculations. The Office of Environment, Safety and Health has placed great emphasis on the acquisition of a new generation of equipment to more efficiently assure dose acquisition and reporting. This action will greatly enhance the timely future publication of this report.

We believe this report, with a new improved format, will provide more effective, accurate, and useful data to organizations involved in radiation protection activities. National and international organizations such as the National Council on Radiation Protection and Measurements, the International Commission on Radiological Protection, and the United Nations Scientific Committee on the Effects of Atomic Radiation continue to rely on DOE radiation exposure data in formulating new recommendations on radiation protection. The information in these reports is also used by the DOE radiation protection community to better identify areas of needed improvement to ensure continued commitment to the as low as reasonably achievable (ALARA) philosophy of radiation protection.



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PREFACE

This report is one of a series of annual reports provided by the U.S. Department of Energy (DOE) summarizing occupational radiation exposures received by DOE and DOE contractor employees. These reports provide an overview of radiation exposures received each year and identify trends in exposures being experienced over the years.

In 1968, the U.S. Atomic Energy Commission (AEC) established a program for reporting certain occupational radiation exposure information to a central radiation records repository. Annual summary reports were published from 1969 through 1973 (WASH-1350-R1 through WASH-1350-R6); these included information on AEC contractor employees and visitors, as well as employees and visitors of companies in the private sector licensed by the AEC.

In January 1975, with the separation of the AEC into the Energy Research and Development Administration (ERDA) and the U.S. Nuclear Regulatory Commission (NRC), each agency assumed responsibility for collecting and maintaining occupational radiation exposure information reported by the facilities under its jurisdiction. Former AEC licensees reported to the NRC while contractors reported to ERDA. At the same time, a contract was established with Union Carbide Corporation at Oak Ridge, Tennessee, to computerize the reporting and processing of both the ERDA and NRC radiation exposure reporting systems. On October 1, 1977, DOE was formed and assumed the responsibilities of ERDA. Processing and programming of exposure information continued at Oak Ridge until October 1978, when management and further development of the DOE radiation exposure reporting system was assigned to the System Safety Development Center, EG&G Idaho, Inc.; the NRC system remained at Oak Ridge.

Radiation exposure data for ERDA and ERDA contractor employees and visitors for 1974 through 1976 were reported in ERDA 76/119, ERDA 77-29, and DOE/EV-0011/9. The DOE and DOE contractor radiation exposure data for 1977-1979 were presented in DOE/EV-0066/10, 11, and 12, respectively. A revised version of the 1979 report was issued as DOE/EP-0039. The data for 1980-1982 were presented in DOE/EP-0040, DOE/EP-0040/1, and DOE/EP-0040/2. The data for 1983-1989 were presented in DOE/PE-0072, DOE/EH-0011, DOE/EH-0036, DOE/EH-0069,

DOE/EH-0128, DOE/EH-0171P, and DOE/EH-0286P, respectively. This report contains 1990 radiation exposure data for DOE and DOE contractor employees and visitors.

Previous reports for AEC/ERDA/DOE government and contractor employees and visitors may be obtained from the DOE Office of Scientific and Technical Information, P.O. Box 62, Oak Ridge, TN 37830.

SUMMARY

All U.S. Department of Energy and DOE contractors are required by DOE Order 5484.1, Chapter IV, to submit occupational radiation exposure records to a central depository. For 1990, data were required to be submitted for all employees who were required to be monitored in accordance with DOE Order 5480.11 and for all visitors who had a positive exposure. The data required included the total effective dose equivalent, external penetrating whole-body dose equivalent, internal dose equivalent, the shallow dose equivalent, neutron dose equivalent, and extremity dose equivalent. Data regarding the exposed individuals included the individual's age, sex, and occupation category. This report is a summary of data reported by DOE and DOE contractors for the calendar year 1990.

A total of 99,443 DOE and DOE contractor employees were reported to have been monitored for whole-body ionizing radiation exposure in 1990. This represents 53.6% of all DOE and DOE contractor employees and is an increase (4.3%) from the number of monitored employees for 1989. In addition to employees, 13,579 visitors were monitored. (For more information, see Table 4.1.)

Of all monitored employees reported, 66.7% received a total effective dose equivalent that was less than measurable, 33.1% received a dose equivalent between measurable and 1 rem (10 mSv), and 0.2% received a dose equivalent greater than 1 rem (10 mSv). Although no employee received a penetrating dose equivalent greater than 3 rem (30 mSv), 22 did receive a total effective dose equivalent greater than 3 rem (30 mSv). The total effective dose equivalent received by 56.3% of the visitors to DOE facilities was less than measurable, 42.9% received a dose equivalent between measurable and 1 rem (10 mSv), and 0.8% received a dose equivalent greater than 1 rem (10 mSv). No visitor received a total effective dose equivalent greater than 3 rem (30 mSv). (These data are detailed in Table 4.1.)

The collective dose equivalent for DOE and DOE contractor employees in 1990 was 2,854 person-rem (28.54 person-Sv), which represents a decrease of 16% from 1989. The collective dose equivalent for visitors was 472 person-rem (4.72 person-Sv), which represents an increase of 55%. The average total effective dose equivalent for all monitored employees reported was 29 mrem (0.29 mSv), and the average dose equivalent for all employees reported who received a measurable exposure was 86 mrem (0.86 mSv). The average dose equivalent for all monitored individuals

(employees and visitors) reported was 29 mrem (0.29 mSv), and the average dose equivalent for all individuals reported who received a measurable exposure was 85 mrem (0.85 mSv). Activities at fuel reprocessing facilities resulted in the highest average dose equivalent of 76 mrem (0.76 mSv) for all monitored individuals reported. The lowest average dose equivalent (2 mrem (0.02 mSv)) was received at DOE offices. These averages are significantly less than the DOE 5 rem/yr (50 mSv/yr) radiation protection standard for whole-body exposures.

Of the ten occupation categories reported, technician workers received both the highest collective dose equivalent (643 person-rem (6.43 person-Sv)) and the highest average dose equivalent per individual who received a measurable exposure (135 mrem (1.35 mSv)). Agricultural workers received both the lowest collective dose (< 1 person-rem (0.01 person-Sv)) and the lowest average dose equivalent (< 1 mrem (<0.01 mSv)) per individual who received a measurable exposure. Service workers also received a low average dose equivalent (10 mrem (0.10 mSv)) per individual who received a measurable exposure.

For both males and females, the 5-year age group receiving the highest collective dose equivalent (544 person-rem (5.44 person-Sv)) was the 35-to-39 age group. The 65-and-greater age group had the highest average dose equivalent of 150 mrem (1.50 mSv) per individual who received a measurable exposure. The group receiving the lowest collective dose equivalent and average dose equivalent per individual who received a measurable exposure was the ≤ 19 age group.

The average dose for all males who received a measurable exposure was 91 mrem (0.91 mSv); for females, the average was 59 mrem (0.59 mSv). Males received a total of 2,904 person-rem (29.04 person-Sv), while females received 312 person-rem (3.12 person-Sv). A total of 111 person-rem (1.11 person-Sv) was received by individuals for whom sex was not specified on the report forms.

Of the 3,327 person-rem (33.27 person-Sv) received by DOE and DOE contractor employees and visitors at DOE facilities, 2,164 person-rem (21.64 person-Sv (65%)) was attributable to beta-gamma exposures, 381 person-rem (3.81 person-Sv (11%)) was attributable to neutron exposures. In addition to the penetrating dose equivalent (beta-gamma and neutron), DOE and DOE contractor employees and visitors received a collective shallow dose of 3,354 person-rem (33.54 person-Sv).

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1.0 INTRODUCTION

The purpose of this report is to disseminate information regarding radiation exposures received at U.S. Department of Energy and DOE contractor facilities. At these facilities, dose equivalents received by both workers and visitors are carefully monitored and recorded. The primary purpose of this practice is to ensure that the DOE occupational dose limits are not exceeded and that as low as reasonably achievable (ALARA) goals are met. A secondary purpose, however, is to provide information that can be used by other organizations and individuals who wish to collect and analyze such information. This information may be useful for estimating the effect of changing dose limits on operations at DOE facilities, determining the progress of DOE with respect to the ALARA principle, or, in combination with other epidemiological data, assisting researchers in assessing the health-effect risks of low doses of ionizing radiation.

This report contains eight main sections and four appendices. Section 2.0 presents relevant DOE operating requirements including dose limits, ALARA, and reporting requirements. Section 3.0 presents brief descriptions of the various categories of DOE facilities and the sources of radiation exposure at each facility category.

Section 4.0 presents a summary of the radiation doses received at DOE and DOE contractor facilities in 1990. The data are presented according to dose-equivalent interval, facility type, field organization, occupation category, age, sex, and type of exposure (external penetrating, shallow, internal, etc.). The section concludes with an evaluation of recent exposure trends at DOE and DOE contractor facilities.

Section 5.0 presents detailed information on total effective dose equivalent and its components. Section 6.0 presents reporting requirements for radiation exposure incidents at DOE and DOE contractor facilities. Section 7.0 presents a comparison of the doses received at DOE and DOE contractor facilities and the consequent risks relative to other risks that occur both in the workplace and as a part of everyday life. Section 8.0 lists the references cited in this report.

Four appendices are included in the report, all of which contain raw exposure data for DOE and DOE contractor employees and visitors. Appendix A presents the 1990 distribution of whole-body dose

equivalents by facility type for each DOE field organization. Appendix B presents the 1990 distribution of whole-body dose equivalents by contractor for each DOE field organization. Appendix C presents the 1990 distribution of whole-body dose equivalents by DOE field organization for DOE government employees and visitors. Appendix D presents 1990 data on penetrating (whole-body) dose equivalents, including neutron and beta-gamma components, internal, and shallow dose equivalents by various combinations of facility type, age, sex, and occupation.

Comments or suggestions that would improve the report or make it more useful should be sent to the U.S. Department of Energy, Assistant Secretary for Environment, Safety, and Health, Washington, D.C. 20585.

2.0 OPERATING REQUIREMENTS

One of the primary objectives of the DOE is to ensure that all its operations and those of DOE contractors are conducted safely. To help achieve this objective, the DOE has established radiation protection standards and program requirements to protect workers from ionizing radiation. The basic DOE standards are radiation dose limits, which establish maximum permissible doses to workers. In addition to the requirement that radiation doses to workers be maintained below the limits, it is the Department's policy that doses be maintained as far below the limits as is reasonably achievable.

2.1 DOSE LIMITS

In order to ensure that workers at DOE facilities are adequately protected from ionizing radiation, the DOE promulgates radiation protection standards for occupational workers. These standards include radiation dose limits to protect workers from both external radiation and internally deposited radionuclides. Radiation dose limits in effect for 1990 were promulgated January 1, 1989, in DOE Order 5480.11. This order included limits on annual dose equivalents to the whole-body and to individual organs (Table 2.1). Personnel monitoring in 1990 was required by DOE Order 5480.11 when the potential existed for an individual to receive an annual effective dose equivalent above 100 mrem (1 mSv), or an annual dose equivalent to an individual organ greater than 10% of the occupational radiation exposure limits shown in Table 2.1. Depending on the administrative policy of the field organization or contractor, monitoring may also have been provided to some or all individuals, such as clerical workers, for whom the exposure potential is extremely low.

The DOE radiation protection standards are based on the Environmental Protection Agency's (EPA's) revised guidance to federal agencies for protection against occupational radiation exposure (EPA 1987). This guidance was a result of a review by EPA of the most recent recommendations of the International Commission on Radiological Protection (ICRP) and the National Council on Radiation Protection and Measurements (NCRP). The primary new feature of the guidance is that weighted internal doses are added to external doses to determine total effective dose equivalent. In the past, these were limited separately. The DOE became the first federal agency to implement the revised guidance when it promulgated its revised radiation protection standards (DOE Order 5480.11) for occupational workers on January 1, 1989.

TABLE 2.1. DOE Limiting Values for Assessed Dose from Exposure of Occupational Workers to Radiation (effective January 1, 1989)

<u>Exposure Category</u>	<u>Limit</u>
Total effective dose equivalent	5 rem/yr (effective dose equivalent)
Lens of eye	15 rem/yr (dose equivalent)
Extremity	50 rem/yr (dose equivalent)
Skin of the whole body	50 rem/yr (dose equivalent)
Other organ or tissue	50 rem/yr (dose equivalent)
Unborn child	0.5 rem/gestation period (dose equivalent)

2.2 ALARA PRINCIPLE

It has long been DOE's policy that radiation exposures should be maintained as far below the dose limits as is reasonably achievable. This policy, known as the ALARA principle of radiation protection, maintains that radiation exposures should be maintained as low as reasonably achievable, economic and social factors being taken into account (ICRP 1977).

The ALARA principle is based on the hypothesis that even very low radiation doses carry some risk. As a result, it is not enough to maintain doses at or slightly below the limits; the lower the doses, the lower the risks. Because it is not possible to reduce all doses at DOE facilities to zero, economic and social factors must be considered to determine the optimal level of radiation doses. According to the ALARA principle, if doses are too high, resources should be well spent to reduce them. At some point, the resources being spent to maintain low doses are exactly balanced by the risks avoided. Reducing doses below this point results in a misallocation of resources; the resources could be spent elsewhere and have a greater impact on health and safety.

To ensure that doses are maintained ALARA at DOE facilities, the DOE has mandated that ALARA plans and procedures be implemented and documented. To help ensure that facilities meet this requirement, the DOE has developed a manual of good practices for reducing exposures to ALARA levels (Munson et al. 1988). These include guidelines for administration of ALARA programs, techniques for performing ALARA calculations based on cost-benefit principles, guidelines for setting

and evaluating ALARA goals, and methods for incorporating ALARA criteria into both radiological design and operations. The establishment of ALARA as a required practice at DOE facilities demonstrates DOE's commitment to ensure minimum risk to workers from the operation of its facilities.

2.3 REPORTING REQUIREMENTS

In 1987, the DOE promulgated revised reporting requirements in DOE Order 5484.1 (DOE 1987). Formerly, contractors were required to report only the number of individuals who received an occupational whole-body exposure in one of 16 dose-equivalent ranges. However, contractors are required by the revised Order to report exposure data for individual employees and visitors. Data required include total effective dose equivalent, external penetrating dose equivalent (including neutron), internal effective dose equivalent, shallow dose equivalent, and extremity dose equivalent. Other data required include the individual's age, sex, employment status, and occupation, as well as the relevant organization and facility type.

3.0 FACILITY DESCRIPTIONS

DOE Order 5484.1 requires contractors to indicate for each reported individual the facility contributing the predominant portion of individual's effective dose equivalent. In cases when this cannot be distinguished, the facility indicated should represent the facility wherein the greatest portion of work service was performed.

The facility indicated must be one of eleven general facility categories: accelerator, fuel/uranium enrichment, fuel fabrication, fuel processing, maintenance and support (site-wide), reactor, general research, fusion research, waste processing/management, weapons fabrication and testing, and other. Because it is not always a straightforward procedure to determine the appropriate facility type for each individual, the assignment of an individual to a particular facility type is a policy decision of each contractor.

The facility descriptions that follow indicate the types of facilities included in each category. Also included are the types of work performed at the facilities and the sources of the majority of the radiation exposures.

3.1 ACCELERATOR

The DOE administers approximately a dozen laboratories that perform significant accelerator-based research. The accelerators range in size from small single-room electrostatic devices to a four-mile circumference synchrotron, and their energies range from keV to TeV.

The differences in accelerator types, sizes, and energies result in differences in the radiation types and dose rates associated with the accelerator facilities. In general, radiation doses to employees at the facilities are attributable to neutrons and x-rays, as well as muons at some larger facilities. Exposure rates inside the primary shielding can range up to 200 mrem/hr as a result of x-ray production near some machine components. Outside the shielding, however, x-ray exposure rates are very low, and neutron dose rates are generally less than 5 mrem/hr (0.05 mSv/hr). Average annual doses at these facilities are slightly higher than the overall average for DOE; however, the collective dose is lower than the collective dose for most other DOE facility categories because of the relatively small number

of employees at accelerator facilities. Regarding internal exposures, tritium and short-lived airborne activation products exist at some accelerator facilities, although annual internal doses are generally quite low.

3.2 FUEL/URANIUM ENRICHMENT

The DOE involvement in the nuclear fuel cycle generally begins with uranium enrichment operations and facilities (Rich et al. 1988). The current method of enrichment is isotopic separation using the gaseous diffusion process, which involves diffusing uranium through a porous membrane and using the different molecular weights of the uranium isotopes to achieve separation.

Although current facility designs and physical controls result in low doses from internally deposited uranium, the primary radiological hazard is the potential for inhalation of airborne uranium (Rich et al. 1988). Because of the low specific activity of uranium, external dose rates are usually a few millirem per hour or less. Most of the external doses that are received are attributable to gamma exposures, although neutron exposures can occur, especially when work is performed near highly enriched uranium. Both the average and collective external doses at these facilities are among the lowest of any DOE facility category.

3.3 FUEL FABRICATION

Activities at fuel fabrication facilities involve the physical conversion of uranium compounds to usable forms, usually rod-shaped metal. Radiation exposures to personnel at these facilities are attributable almost entirely to gamma and beta radiation. However, beta radiation is considered the primary external radiation hazard because of high beta dose rates (up to several hundred mrad per hour) at the surface of uranium rods (Rich et al. 1988). For example, physical modification of uranium metal by various metalworking operations, such as machining and lathing operations, requires protection against beta radiation exposures to the skin, eyes, and extremities. Average external doses at fuel fabrication facilities are generally higher than at other types of DOE facilities; however, collective doses are relatively low because the number of employees is low. Internal doses from inhalation of uranium are kept very low.

3.4 FUEL PROCESSING

The DOE administers several facilities that reprocess spent reactor fuel. These facilities separate the plutonium produced in reactors for use in defense programs. They also separate the fission products and uranium; the fission products are normally designated as radioactive waste products, while the uranium can be refabricated for further use as fuel.

The very high radioactivity of fission products in spent nuclear fuel results in employees at fuel processing facilities consistently having among the highest average doses of any DOE facility type. However, the collective dose at these facilities is less significant because of the small total number of employees. Penetrating doses are attributable primarily to gamma photons, although some neutron exposures do occur. Skin and extremity doses from handling of samples are also significant, although only a few employees typically receive skin doses greater than 5 rem (50 mSv) per year. Strict controls are in place at fuel reprocessing facilities to prevent internal depositions; however, several measurable intakes typically occur per year. Plutonium isotopes represent the majority of the internal depositions, and annual effective dose equivalents from the depositions are typically less than 500 mrem (5 mSv).

3.5 MAINTENANCE AND SUPPORT

Most DOE sites have facilities dedicated to maintaining and supporting the site. In addition, some employees may be classified under this facility type if their main function is to provide site maintenance and support, even though they may not be located at a single facility dedicated to that purpose.

Because many maintenance and support activities at DOE sites do not involve work near sources of ionizing radiation, the average dose equivalent per monitored employee is typically among the lowest of any facility type. However, those employees who do perform work near radiation sources receive relatively high average annual doses, as is indicated by the relatively high average annual dose per employee who receives a measurable exposure. Also, collective doses are relatively high because there is a large number of these employees relative to the number classified under other facility types. The sources of ionizing radiation exposure are primarily gamma photons. However, variations in the

types of work performed and work locations result in exposures of all types, including exposures to beta particles, x-rays, neutrons, and airborne radioactivity.

3.6 REACTOR

The DOE and its predecessors have built and operated dozens of nuclear reactors since the mid-1940s. These facilities have included plutonium and tritium production reactors, prototype reactors for energy production, research reactors, reactors designed for special purposes such as production of medical radioisotopes, and reactors designed for the propulsion of naval vessels.

In 1989, many of the DOE reactors were not operating. As a result, personnel exposures at DOE reactor facilities were attributable primarily to gamma photons and beta particles from contaminated equipment and plant areas, spent reactor fuel, activated reactor components, and other areas containing fission or activation products encountered during plant maintenance and decommissioning operations. Neutron exposures do occur at operating reactors, although the resultant doses are a very small fraction of the collective penetrating doses. Gamma dose rates in some plant areas can be very high (up to several rems per hour), requiring extensive protective measures. The average and collective external doses relative to other facility types are highly dependent on the status of reactor operations. Inhalation of airborne radioactive material is a concern in some plant areas. However, protective measures, such as area ventilation or use of respiratory-protection equipment, result in low internal doses.

3.7 RESEARCH, GENERAL

The DOE contractors perform research at many DOE facilities, including all of the national laboratories. Research is performed in general areas including biology, biochemistry, health physics, materials science, environmental science, epidemiology, and many others. Research is also performed in more specific areas such as global warming, hazardous waste disposal, energy conservation, and energy production, just to name a few.

The wide variety of research being performed at DOE facilities results in a wide variety of radiological conditions at those facilities where ionizing radiation or radioactive materials are an

important part of the research. Depending on the research performed, personnel may be exposed to virtually any type of external radiation, including beta particles, gamma photons, x-rays, and neutrons, as well as the potential for inhalation of radioactive material. Area dose rates and individual annual doses are also highly variable. Relative to other facility types, average annual individual doses are slightly above average at general research facilities. The collective dose equivalent is higher than at most other facility types because of the many individuals employed at general research facilities.

3.8 RESEARCH, FUSION

The DOE currently operates on major and several smaller facilities that participate in research on fusion energy. In general, both penetrating and shallow radiation doses are minimal at these facilities because the dose rates near the equipment are both low and intermittent. The external doses that do occur are attributable primarily to x-rays from energized equipment. Relative to other DOE facility types, average individual doses and collective doses are typically the lowest at fusion research facilities. Regarding internal exposures, airborne tritium is a concern at some fusion research facilities, although the current level of operation results in minimal doses.

3.9 WASTE PROCESSING/MANAGEMENT

Most DOE sites have facilities dedicated to the processing and disposal of radioactive waste. In general, the dose rates to employees when handling waste are very low because of the low specific activities or the effectiveness of shielding materials. As a result, very few employees at these facilities receive annual doses greater than 100 mrem (1 mSv). At two DOE sites, however, large-scale waste processing facilities exist in order to properly dispose of radioactive waste products generated during the nuclear fuel cycle. At these facilities, radiation doses to some employees can be relatively high, sometimes exceeding 1 rem/yr (10 mSv/yr). Penetrating doses at waste processing facilities are mostly attributable to gamma photons; however, neutron exposures are significant at the large-scale facilities. Skin doses are generally not a significant problem. Overall average annual doses at waste processing/management facilities are among the highest of any DOE facility type, which is attributable primarily to the two large-scale facilities. The annual collective doses are closer

to the average of all facility types, however, because of the relatively small number of employees at this type of facility.

3.10 WEAPONS FABRICATION AND TESTING

The primary function of a facility in this category is to fabricate weapons-grade material for the production or testing of nuclear weapons. At the testing facilities, radiation doses received by personnel are generally minimal because of the strict controls over personnel access to testing areas, although extremity doses can be relatively high from handling neutron-activated materials. Radiation doses are a greater concern at facilities where weapons and weapons-grade nuclear material are handled. At these facilities, neutron radiation dose rates can be significant when processing relatively small quantities of ^{238}Pu or larger quantities of mixed plutonium isotopes (Faust et al. 1988). Penetrating doses from gamma photons and plutonium x-rays can also be significant in some situations, as can skin and extremity doses from plutonium x-rays. Overall, average individual annual doses at these facilities are slightly higher than the DOE average. The collective doses received by employees at these facilities are generally higher than the collective doses at other facility types because of the large number of individuals employed.

Also of significant concern at these facilities is inhalation of plutonium, where inhalation of very small amounts could result in doses exceeding limits. To prevent plutonium intakes, strict controls are in place including process containment, contamination control procedures, and air monitoring and bioassay programs (Faust et al. 1988). As a result, significant internal exposures are very rare at these facilities.

3.11 OTHER

Individuals placed in this facility type can be generally classified under three categories: 1) those who worked in a facility that did not match one of the ten facility types described above; 2) those who did not work for any appreciable time at any specific facility, such as transient workers; or 3) those for whom facility type was not indicated on the report forms. Examples of a facility type not included in the ten described above include construction and irradiation facilities. In general, employees classified under this facility type receive annual doses significantly less than the annual doses averaged

over all DOE facilities. However, the wide variation in the type of work performed by these individuals results in a wide variation in the types and levels of exposures. Although exposures to gamma photons are predominant, some individuals may be exposed to beta particles, x-rays, neutrons, or airborne radioactive material.

4.0 SUMMARY OF IONIZING RADIATION DOSES

Monitoring in 1990 was required by DOE Order 5480.11 when the potential existed for an individual to receive an annual effective dose equivalent above 100 mrem (1 mSv), or an annual dose equivalent to individual organs above 10% of the exposure limits. Depending on the administrative policy of the contractor, monitoring may also have been provided to individuals, such as clerical workers, for whom the exposure potential is extremely low.

On November 6, 1987, DOE promulgated revised reporting requirements in DOE Order 5484.1, which affected the reporting of occupational doses received during 1987 and beyond. Before 1987, DOE contractors were required to report only the number of individuals who received an occupational whole-body exposure in one of 16 dose-equivalent intervals ranging from "less than measurable" to "greater than 10 rem." Contractors are now required, however, to submit detailed exposure data for individual employees who were monitored and for visitors who received a measurable exposure. (Contractors are also required to provide a count of the total number of visitors monitored.) Data now required to be submitted for each individual include total effective dose equivalent, external penetrating dose equivalent (including neutron), shallow dose equivalent, and extremity dose equivalent. This report is a summary of the dose equivalents received by DOE and DOE contractor employees and visitors in 1990 as reported pursuant to DOE Order 5484.1.

This report is the first to contain data on total effective dose equivalent, internal dose, and extremity dose for all DOE sites. In past reports, the primary radiation quantity analyzed was whole-body penetrating dose. Beginning with this report, the primary quantity to be analyzed will be total effective dose equivalent. Additional information on penetrating dose, internal dose, and extremity dose is given in Section 5.0 and Appendix D of this report. Caution should be used when comparing these data to those of past annual reports since the total effective dose quantity represent the total of the penetrating and internal dose components for employees and visitors. Data shown in tables and graphs for years previous to 1990 represent only the values for whole-body penetrating dose.

4.1 DISTRIBUTION BY DOSE INTERVAL

The number of employees and visitors who received a total effective dose equivalent in each of 16 dose-equivalent ranges is presented in Table 4.1. A total of 99,443 DOE and DOE contractor employees were reported to have been monitored for whole-body ionizing radiation exposure in 1990. This represents 56.1% of all DOE and DOE contractor employees. In addition to the employees, 13,579 visitors were monitored at DOE facilities. Visitors may include radiation workers from another DOE facility present on a temporary basis.

TABLE 4.1. Distribution of Whole-Body Ionizing Radiation Doses for DOE/DOE Contractor Employees and Visitors by Dose-Equivalent Interval, 1990^(a)

Dose-Equivalent Interval (rem)	Number of Persons			Collective Person-rem		
	Employees	Visitors	Total	Employees	Visitors	Total
< Measurable	66,297	7,648	73,945	0	0	0
Measurable to 0.10	26,697	5,121	31,818	694	104	797
0.10 to 0.25	3,758	380	4,138	582	57	639
0.25 to 0.50	1,637	194	1,831	568	71	639
0.50 to 0.75	532	93	625	321	56	378
0.75 to 1.00	272	41	313	236	36	271
1 to 2	191	92	283	249	127	377
2 to 3	37	10	47	89	22	110
3 to 4	8	0	8	27	0	27
4 to 5	8	0	8	36	0	36
5 to 6	1	0	1	5	0	5
6 to 7	2	0	2	13	0	13
7 to 8	0	0	0	0	0	0
8 to 9	1	0	1	8	0	8
9 to 10	0	0	0	0	0	0
> 10	2	0	2	26	0	26
Total	99,443	13,579	113,022	2,854	472	3,327

(a) Minor variations in collective dose-equivalent values may be due to rounding.

No DOE or DOE contractor employee received a total effective dose equivalent greater than 5 rem (50 mSv) due to exposures received during 1990. There are six individuals, however, who did receive a total effective dose equivalent greater than 5 rem (50 mSv) because of past internal uptakes of radionuclides. Annual dose due to these past internal uptakes is calculated each year and is expressed in the values for total effective dose equivalent. As with the 1988 and 1989 reporting years, no DOE or DOE contractor employee received a whole-body penetrating dose equivalent greater than 3 rem (30 mSv), which is significantly less than the DOE radiation protection standard of 5 rem (50 mSv) (See Table 4.2).

A comparison of the number of DOE and DOE contractor employees, the number of monitored employees reported, and the number of monitored employees reported who did not receive a measurable dose equivalent is presented for the years 1980-1990 in Figure 4.1. The figure also illustrates the average dose equivalent per employee who received a measurable exposure. The number of monitored employees reported for 1990 has increased from the number reported for previous years because of the greater number of DOE and DOE contractor employees involved in environmental remediation activities and because of the requirements of DOE Order 5480.11.

Of the monitored employees reported for 1990, 66.6% received a total effective dose equivalent that was less than measurable; 33.1% received a dose equivalent between measurable and 1 rem (10 mSv); and 0.3% received a dose equivalent greater than 1 rem (10 mSv) (Figure 4.2). The dose equivalent received by 56.3% of the visitors to DOE facilities was less than measurable; 42.9% received a dose equivalent between measurable and 1 rem (10 mSv); and 0.8% received a dose equivalent greater than 1 rem (10 mSv) (Figure 4.2). No visitor received a dose equivalent greater than 3 rem (30 mSv).

TABLE 4.2. Distribution of Whole-Body Ionizing Radiation Doses for DOE/DOE Contractor Employees, 1965-1990^(a)

Year	Number of Employees Receiving Radiation Doses in Each Dose-Equivalent Range (rem)														Monitored
	0-1 <Meas.	Meas.-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	>12	
1965	128,360	4,158	1,704	515	294	70	32	26	25	22	6	2		135,214	
1966	131,522	3,706	1,630	593	313	88	47	24	6	2			1	137,932	
1967	102,510	3,472	1,572	555	168	35	29	23	17	4	1			108,386	
1968	103,206	2,799	1,408	425	144	3	1							107,986	
1969	98,625	2,554	1,313	335	86	4					1			102,918	
1970	92,185	2,698	1,329	279	158	5	4	2	2	1				96,661	
1971	90,640	2,380	888	275	118	8	3				1		2	94,315	
1972	86,077	2,130	929	219	95	8	2							89,460	
1973	89,071	1,944	727	172	60	2	1							91,977	
1974	43,184	32,500	1,667	688	149	40	4							78,232	
1975	43,310	42,141	1,846	753	232	142			1					88,425	
1976	40,083	47,886	1,679	475	70	6	1							90,200	
1977	43,017	49,948	1,579	545	103	23		1	2				2	95,220	
1978	44,898	55,296	1,323	439	53	11								102,020	
1979	50,003	52,235	1,286	416	33	10	1						2	104,986	
1980	45,054	38,895	1,113	387	16									85,465	
1981	45,224	36,561	967	263	29	5								83,049	
1982	48,968	34,949	1,010	313	56	28								85,324	
1983	49,871	36,768	1,270	294	49	31								88,283	
1984	47,327	42,696	1,226	312	31	11								91,603	
1985	55,939	38,085	1,366	356	51	8			1					95,806	
1986	54,581	37,774	1,298	349	35	1	1					1		94,040	
1987	46,512	32,939	1,258	283	36									81,028	
1988	49,833	31,260	502	34										81,629	
1989	57,533	32,891	437	21										90,882	
1990	66,297	32,896	191	37	8	8	1	2	1	1	1	1	1	99,443	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

(b) Separation of data before 1974 is unavailable.

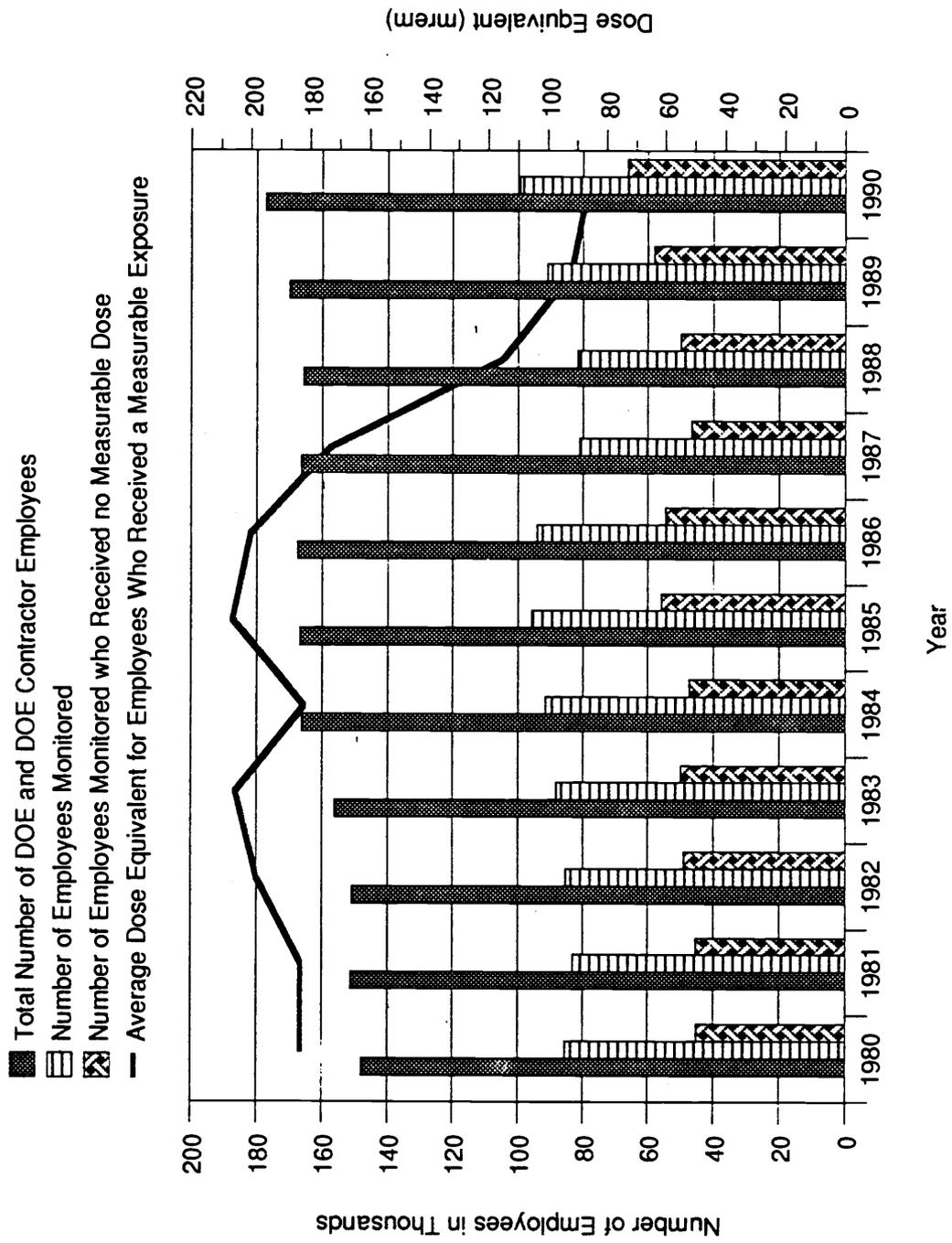
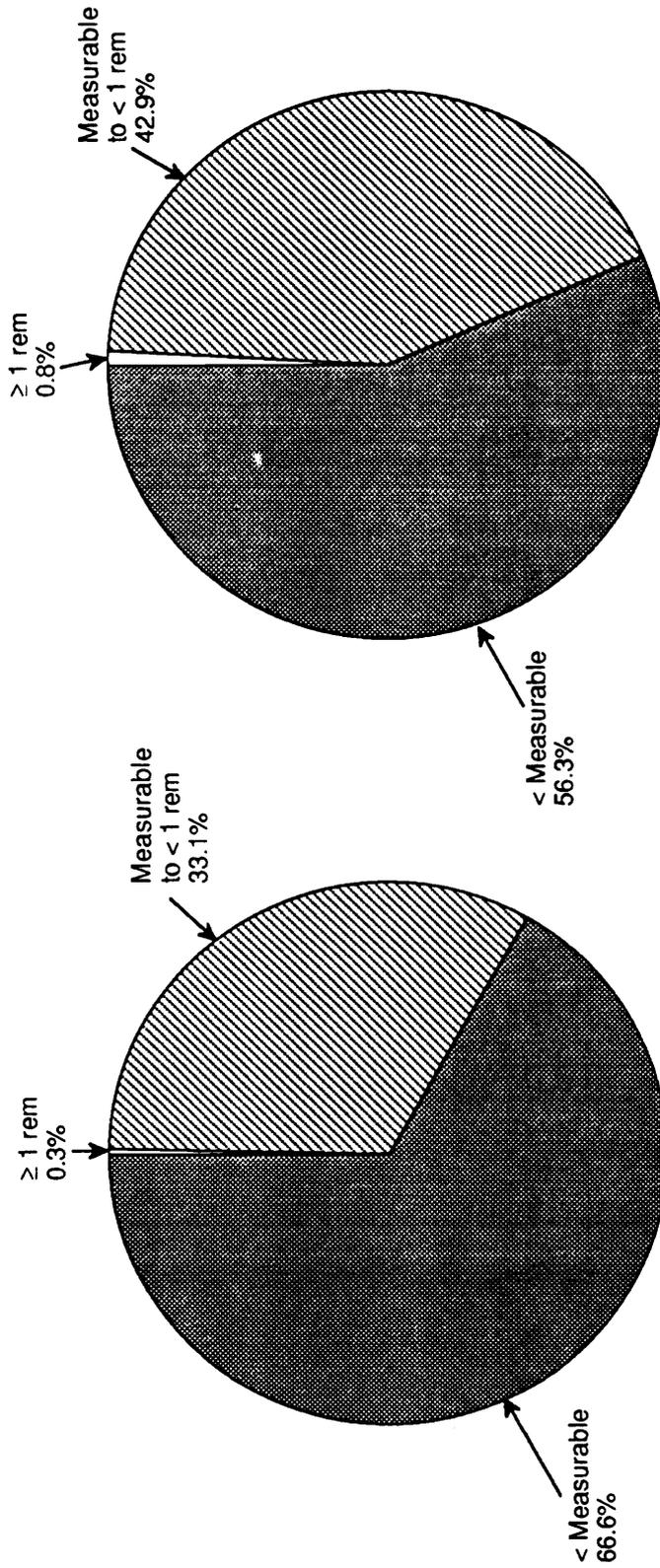


FIGURE 4.1. Comparison of Number of Employees, Number of Employees Monitored, and Number of Employees Monitored Who Received No Measurable Dose Equivalent, 1980-1990



DOE and DOE Contractor Employees
(99,443 Monitored)

Visitors
(13,579 Monitored)

FIGURE 4.2. Percentage of Monitored Employees and Percentage of Monitored Visitors Who Received Dose Equivalents Less than Measurable, Measurable to 1 rem, or Greater Than 1 rem, 1990

The total effective collective whole-body dose equivalent was 2,854 person-rem (28.54 person-Sv) for all DOE and DOE contractor employees, and 472 person-rem (4.72 person-Sv) for visitors to DOE facilities, for a total DOE collective dose equivalent of 3,327 person-rem (33.27 person-Sv). The contribution of the individuals (employees and visitors) in each dose-equivalent interval to the collective dose equivalent is shown in Figure 4.3. Individuals whose exposure was between measurable and 1 rem (10 mSv) contributed the greatest portion (81.9%) of the total person-rem.

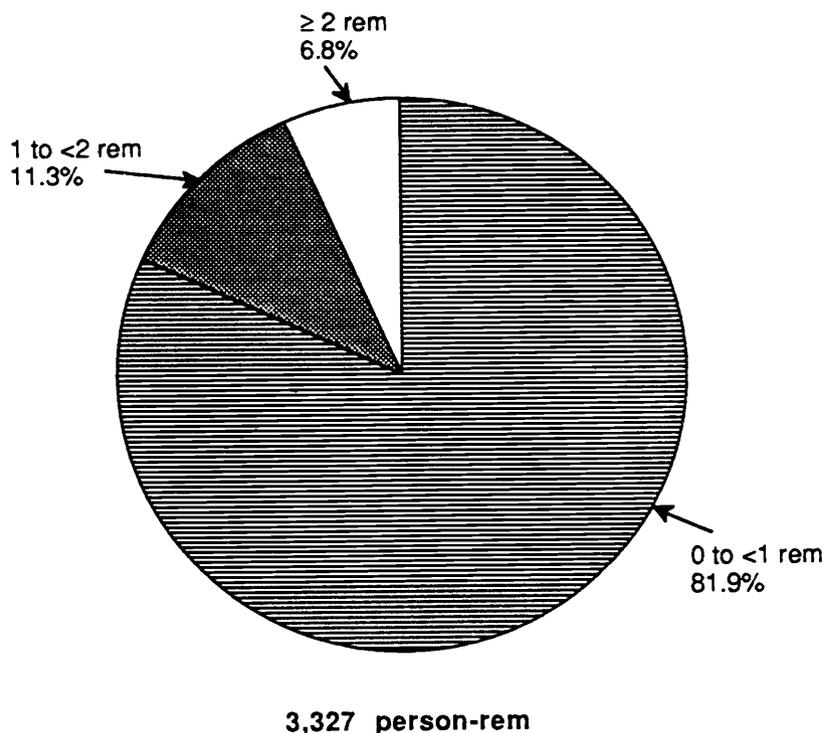


FIGURE 4.3. Contribution of Each Dose-Equivalent Interval to the Total Collective Dose Equivalent, 1990

The distribution of whole-body doses for DOE and DOE contractor employees for the years 1965-1990 is presented in Table 4.2. As indicated, the fraction of all monitored employees who received a dose equivalent greater than 1 rem (10 mSv) has declined dramatically since 1965, starting at about 5%, leveling off at about 2% from 1977 to 1987, and dropping to less than 1% in 1988, 1989, and 1990. This general downward trend in occupational radiation exposures can be observed in Figure 4.4, which shows the collective dose equivalent for employees who received a dose equivalent greater than 1 rem (10 mSv) from 1965 to 1990. The collective dose equivalent for employees who received an exposure less than 1 rem (10 mSv) was not included because, before 1974, less-than-measurable exposures were not distinguished from measurable exposures in the reporting system. The trend reflects both changes in the nature of the work performed at DOE facilities and the required application of ALARA practices throughout all DOE operations. The most recent decrease may be attributable in part to reduced operations and mission changes at some DOE facilities.

Analysis of occupational doses is commonly performed by fitting the data to a lognormal distribution (Brodsky et al. 1976; Brooks 1988). Figure 4.5 presents the 1990 data for DOE and DOE contractor employees on a lognormal probability plot. If the data in Figure 4.5 were truly distributed lognormally, the data points would form a straight line. The fact that the distributions curve upward indicate that the DOE occupational dose distributions are affected significantly by dose limits.

Figure 4.5 is useful for indicating the fraction of employees whose dose equivalents exceed various values as well as the fraction of the collective dose equivalent that is attributable to various ranges of individual dose equivalent. For example, the figure indicates that although less than 1% of monitored DOE and DOE contractor employees received a dose equivalent greater than 1 rem (10 mSv), approximately 20% of the employee collective dose equivalent was attributable to individual dose equivalents greater than 1 rem (10 mSv).

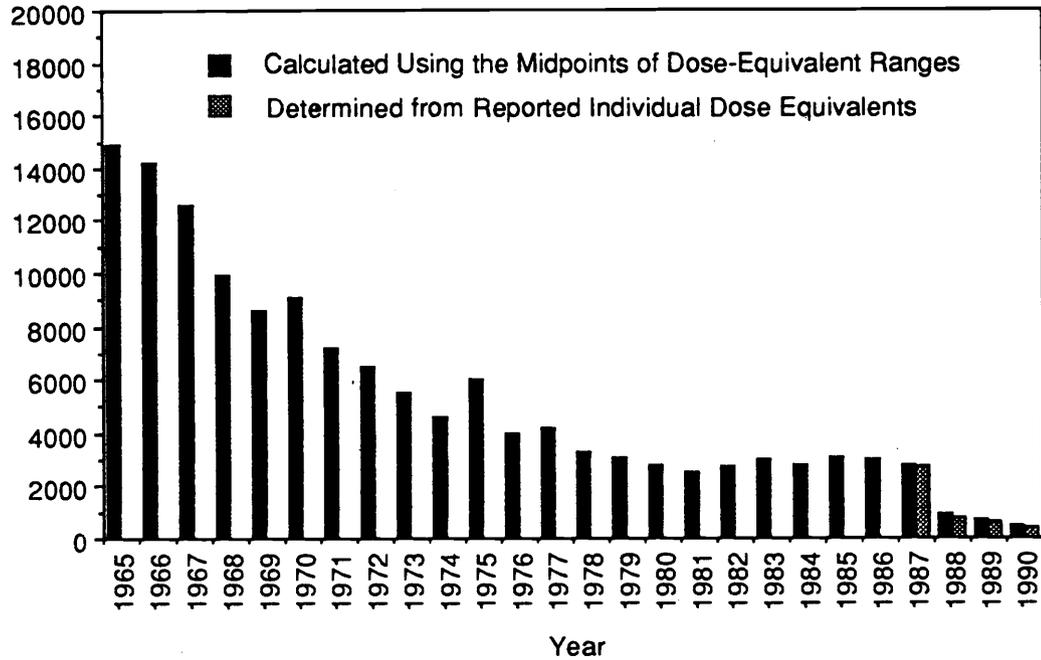


FIGURE 4.4. Total Collective Dose Equivalent for All DOE/DOE Contractor Employees Who Received a Dose Equivalent Greater Than 1 Rem, 1965-1990

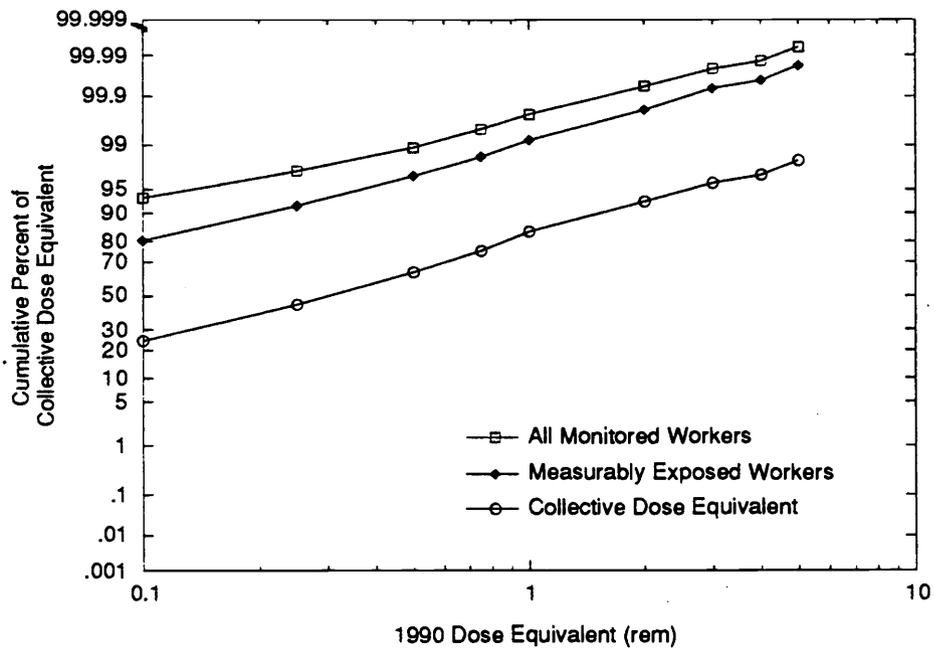


FIGURE 4.5. Lognormal Probability Plots of Annual Exposure for Potentially Exposed and Measurably Exposed DOE and DOE Contractor Employees, 1990

4.2 DISTRIBUTION BY FACILITY TYPE

The number of individuals (employees and visitors) and the distribution of the annual whole-body dose equivalents in each of 11 facility categories were reported to the central repository. The assignment of exposures to one of the 11 facility types (listed in DOE Order 5484.1) is a policy decision of each field organization. For this section of the report, the categories of "visitors" and "DOE offices" were each considered a "facility type." The contribution of each facility type to the collective dose equivalent is shown in Figure 4.6. The largest percentage of the total collective dose equivalent (25.2%) was in the category "Weapons Fabrication and Testing." The smallest contribution (0.1%) was from DOE offices. A summary of the data is presented in Table 4.3.

Collective dose increased 64%, when compared with 1989 data, for the "Weapons Fabrication and Testing" category. This increase is due to the contribution of internal dose to the total effective dose equivalent quantity for 1990. Most of the uptakes of internal emitters that contributed to internal dose

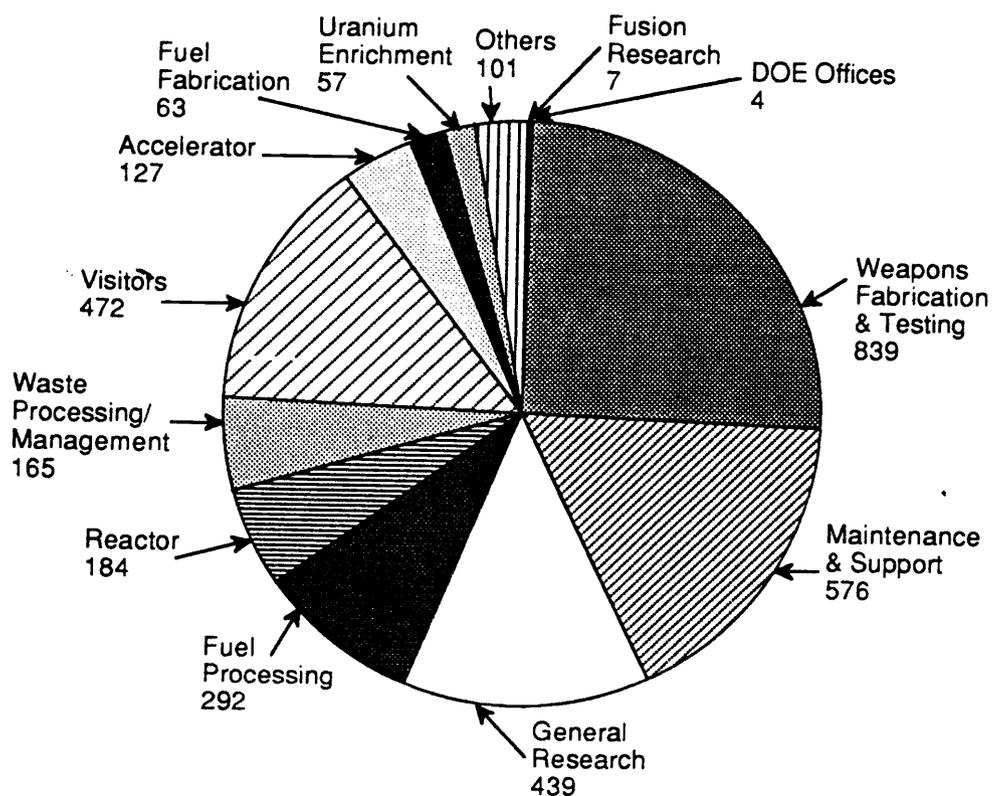


FIGURE 4.6. Contribution of Each Facility Type to the Total Collective Effective Dose Equivalent, 1990 (numbers indicate person-rem)

TABLE 4.3. Distribution of Annual Whole-Body Radiation Doses for Monitored DOE/DOE Contractor Employees and Visitors by Facility Type, 1990^(a)

Facility Type	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	.Total Person-rem					
	< Meas.	<0.10	0.25	0.50	0.75	1.00	1-2	2-3	3-4	4-5	5-6			6-7	7-8	8-9	9-10	>10
Accelerator	3,150	1,148	182	80	28	17	3										4,608	127
Fuel/Uran. Enrichment	3,543	2,108	80	11													5,742	57
Fuel Fabrication	1,451	544	115	51	11	4	2										2,178	63
Fuel Processing	2,188	935	368	194	76	55	24	5									3,845	292
Maint. and Support	17,370	5,866	835	409	114	41	29	5									24,669	576
Reactor	2,414	2,220	321	92	40	15	4										5,106	184
Research, General	12,864	3,437	399	227	104	52	56	6	1	1					1		17,148	439
Research, Fusion	877	195	12	1													1,085	7
Waste Proc./Management	3,145	1,464	260	115	30	15	8	2									5,039	165
Weapons Fab. & Test.	8,982	5,765	1,082	417	125	71	62	19	8	6	1	1	1	1	1		16,541	839
Other	8,770	2,831	102	40	4	2	3								1		11,753	101
Visitors	7,648	5,121	380	194	93	41	92	10									13,579	472
DOE Offices	1,543	184	2														1,729	4
Total Persons	73,945	31,818	4,138	1,831	625	313	283	47	8	8	1	2	1	1	1		211,022	
Total Person-rem		797	639	639	378	271	377	110	27	36	5	13	8	8	26		3,326	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

for 1990 occurred during previous reporting years. A 56% increase in collective dose, when compared with 1989 data, is also seen for the "Visitors" category.

Collective dose decreases of 44% and 41% were seen for the "Reactor" and "Fuel Processing" categories, respectively. These decreases were probably due to reduced activities in both of these production-related categories during 1990. A decrease in collective dose of 14% was also seen for the "General Research" category. This decrease, along with an overall decrease in total collective dose when compared with 1989, is likely due to ongoing efforts within the DOE community to follow the ALARA concept of radiation protection.

The average dose equivalent by facility type per individual monitored and per individual who received a measurable dose equivalent is shown in Table 4.4. The average dose equivalent per individual monitored for all facilities was 29 mrem (0.29 mSv). The highest average dose equivalent per individual monitored (76 mrem) (0.76 mSv) was observed at fuel processing facilities, and the lowest was observed at DOE offices (2 mrem) (0.02 mSv). The average dose equivalent per individual who received a measurable dose equivalent was 85 mrem (0.85 mSv). The highest average dose equivalent per individual who received a measurable dose equivalent (176 mrem) (1.76 mSv) was observed at fuel processing facilities, and the lowest (21 mrem) (0.19 mSv) was observed at DOE offices.

4.3 DISTRIBUTION BY FIELD ORGANIZATION

For each field organization, the number of monitored individuals reported, the number of individuals who received a measurable dose equivalent, and the collective dose equivalent are shown in Table 4.5.

Differences in the collective dose equivalent at each field organization reflect differences in the number of employees at the facilities, the nature of the work performed, and the administrative policy concerning whether the dose distribution is reported for all monitored employees or only for those for whom monitoring is required. Table 4.6 provides an indication of the work performed at each field organization by showing the fraction of the collective dose equivalent attributed to each facility type

TABLE 4.4. Collective Dose-Equivalent for Monitored DOE/DOE Contractor Employees and Visitors by Facility Type, 1990^(a)

Facility Type	Number of Individuals	Number of Individuals with Measurable Doses	Collective Dose-Equivalent (Person-rem)	Average Dose-Equivalent (mrem) per Individual	Average Dose-Equivalent (mrem) per Individual with Measurable Doses
Accelerator	4,608	1,455	127	28	87
Fuel/Uran. Enrichment	5,742	2,199	57	10	26
Fuel Fabrication	2,178	727	63	29	86
Fuel Processing	3,845	1,657	292	76	176
Maint. and Support	24,669	7,299	576	23	79
Reactor	5,108	2,692	184	36	68
Research, General	17,148	4,284	439	26	102
Research, Fusion	1,085	208	7	6	34
Waste Proc./Management	5,039	1,894	165	33	87
Weapons Fab. & Test.	16,451	7,559	839	51	111
Other	11,753	2,983	101	9	34
Visitors	13,579	5,931	472	35	80
DOE Offices	1,729	189	4	2	21
Total	113,022	39,077	3,327	29	85

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE 4.5. Collective Dose-Equivalent for Monitored DOE/DOE Contractor Employees and Visitors by Field Organization, 1990^(a)

Field Organization	Number of Monitored Individuals	Number of Individuals with Measurable Doses	Collective Dose-Equivalent (Person-rem)	Average Dose-Equivalent (mrem) per Individual	Average Dose-Equivalent (mrem) per Individual with Measurable Doses
Albuquerque Operations	21,581	3,003	363	17	121
Chicago Operations	10,354	3,125	214	21	69
DOE Headquarters	550	7	0	0	21
Idaho Operations	5,976	2,182	366	52	168
Nevada Operations	1,077	60	7	6	116
Oak Ridge Operations	14,149	4,671	173	12	37
Pittsburgh N.R. Office	2,054	884	23	11	26
Richland Operations	8,894	3,819	353	40	92
Rocky Flats Operations	9,339	6,768	769	82	114
San Francisco Operations	9,339	781	64	6	82
Savannah River Operations	24,678	11,659	753	31	65
Schenectady N.R. Office	2,902	2,118	240	83	114
Total DOE	113,022	39,077	3,327		
Average DOE				29	85

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE 4.6. Percent of Collective Dose-Equivalent for Monitored DOE/DOE Contractor Employees and Visitors Attributed to a Facility Type Within Each Field Organization, 1990^(a)

Field Organization	Facility Type											DOE Office	
	Fuel			Maint& Proc Support		Research			Waste Weapon Proc.		F&T		Other
	Accel	Enrich	Fab.	Proc	Support	Reactor	Genrl	Fusion	Proc.	F&T	Other	Other	
Albuquerque Operations	12.7			7.3		3.3	58.7	0.2	2.5	7.5	1.7	6.0	0.1
Chicago Operations	30.6		0.6	-	5.3	8.6	27.3	2.8	1.0		0.2	23.6	0.1
DOE Headquarters													100.0
Idaho Operations				39.8	1.3	8.5	3.4		0.8		8.5	37.7	
Nevada Operations					51.6					48.4			
Oak Ridge Operations							19.7		0.2	24.9		9.5	
Pittsburgh N.R. Office							90.7				7.2	2.1	
Richland Operations				0.2	3.0	34.5	14.1	17.3	27.6		2.2	0.7	0.2
Rocky Flats Operations										97.9		2.1	
San Francisco Operations	24.4	4.0			28.0		19.1	0.8	0.1	6.7	9.8	7.1	
Savannah River Operations				4.8	18.0	51.8	5.5	2.6	7.1	1.1	6.4	2.4	0.3
Schenectady N.R. Office							12.9	2.8				84.3	
Total DOE	3.8	1.7	1.9	8.8	17.3	5.5	13.2	0.2	5.0	25.2	3.0	14.2	0.1

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

at each field organization. Table 4.7 presents collective dose equivalents for each field organization from 1980 to 1990.

4.4 DISTRIBUTION BY OCCUPATION CATEGORY

DOE Order 5484.1 requires that for each monitored individual (employee and visitor), a three-digit occupation code be included indicating the generic occupation that best fits the individual's occupation title. The 44 three-digit codes pertain to DOE occupation codes summarizing all Standard Occupational Classification (SOC) codes from the Department of Commerce's SOC Manual of 1980. The DOE is considering a revised requirement to report occupations by the full four-digit SOC code. This would eliminate the need for an intermediate code, standardize occupational classifications, and provide research data at a greater level of detail.

For this report, the 44 DOE occupational classifications were summarized into 11 general occupations to facilitate analysis:

- **Management** - managers and administrators, sales, support and clerical
- **Scientists** - scientists, engineers, health physicists, miscellaneous professionals, physicians, and nurses
- **Technicians** - health technicians, engineering technicians, science technicians, radiation monitors/technicians, miscellaneous technicians
- **Service** - firefighters, security guards, food service employees, janitors, miscellaneous service
- **Agriculture** - groundskeepers, forest workers, miscellaneous agriculture
- **Construction** - mechanics/repairers, masons, carpenters, electricians, painters, pipe fitters, miners/drillers, miscellaneous repair/construction
- **Production** - machinists, sheet metal workers, operators - plant/system/utility, machine setup/operators, welders and solderers, miscellaneous precision/production
- **Transport** - truck drivers, bus drivers, pilots, equipment operators, miscellaneous transport
- **Laborers** - handlers/laborers/helpers
- **Miscellaneous** - military, miscellaneous
- **Unknown** - indicates that an occupation code was not specified on the form.

TABLE 4.7. Collective Dose-Equivalent (person-rem)^(a) for Monitored DOE/DOE Contractor Employees and Visitors by Field Organization, 1980-1990^(b)

Field Organization	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Albuquerque Operations ^(c)	873	1,147	1,112	1,190	1,423	1,344	979	483	556	432	363
Chicago Operations	918	758	587	623	615	502	408	348	310	240	214
Idaho Operations	593	302	363	353	441	420	620	318	253	336	366
Nevada Operations	50	36	29	25	24	34	65	8	13	6	7
Oak Ridge Operations	604	437	401	371	419	353	587	517	360	218	173
Pittsburgh N.R. Office	186	185	194	220	180	180	109	78	86	85	23
Richland Operations	2,256	2,093	2,272	2,458	2,399	2,548	2,321	2,477	654	619	353
Rocky Flats Operations ^(c)	827	877	1,173	1,142	1,315	1,556	1,407	880	654	412	769
San Francisco Operations	240	171	289	267	195	187	99	78	74	82	64
Savannah River Operations	1,391	1,401	1,310	1,293	1,283	1,394	1,498	945	887	804	753
Schenectady N.R. Office	79	76	147	217	130	165	167	220	81	140	240
Total	8,024	7,483	7,879	8,158	8,422	8,684	8,261	6,353	3,928	3,375	3,327

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

(b) The data may differ slightly from previous reports due to revisions received after publication.

(c) Effective 1/1/90, Rocky Flats Operations was designated as a separate DOE field organization. Accordingly, all current and historical radiation data associated with the Rocky Flats facilities have been extracted from Albuquerque Operations data and identified separately.

Table 4.8 lists the number of individuals monitored, the number of individuals monitored who received a measurable dose equivalent, and the average dose equivalents for each occupation category. The "Scientists" category accounted for both the most individuals monitored and the most individuals monitored who received a measurable exposure. Individuals in the "Production" category received the highest average dose equivalent per individual monitored (69 mrem (0.69 mSv)). Technicians received the highest average dose equivalent per individual monitored who received a measurable exposure (135 mrem (1.35 mSv)). Figure 4.7 illustrates the data in Table 4.8 including an indication of the sex distribution of the individuals. Figure 4.8 illustrates the collective dose equivalent values in Table 4.8 as a pie chart. Table 4.9 lists the number of individuals monitored according to occupation and facility type.

4.5 DISTRIBUTION BY AGE AND SEX

The 1990 exposure data submitted per DOE Order 5484.1 included information on the age and sex of the exposed individuals (employees and visitors). Unfortunately, some records were submitted without the required information. For the analysis in this report, 12 age categories were defined: 19 and less, 65 and greater, nine 5-year age groups beginning with the 20-24 age group and ending with the 60-64 age group, and unknown age. Regarding sex of the exposed individuals, a separate category for unspecified sex was defined. It was clear from the data that if sex was not specified on the form, other information such as age, occupation, or facility type was likely to be unspecified or unknown as well. For example, of the 3,221 individuals for whom sex was not specified on the report form, 3,057 (95%) also were not identified by age. Similarly, the occupation was listed as unknown or was unspecified for 2,287 (71%) of the individuals for whom sex was unspecified.

TABLE 4.8. Distribution of Whole-Body Ionizing Radiation Dose for DOE/DOE Contractor Employees and Visitors by Occupation, 1990^(a)

<u>Occupation</u>	<u>Number of Individuals Monitored</u>	<u>Number of Individuals Monitored Who Received a Measurable Exposure</u>	<u>Collective Dose Equivalent (person-rem)</u>	<u>Average Dose Equivalent per Individual Monitored (mrem)</u>	<u>Average Dose Equivalent per Individual Monitored Who Received a Measurable Exposure (mrem)</u>
Unknown	18,244	5,636	566	31	100
Management	13,090	3,425	237	18	69
Scientists	30,403	8,304	512	17	62
Technicians	11,898	4,775	643	54	135
Service	7,548	2,484	75	10	30
Agriculture	122	22	0	0	0
Construction	14,628	7,050	556	38	79
Production	8,402	4,550	581	69	128
Transportation	2,232	701	37	17	53
Laborers	2,089	971	93	45	96
Miscellaneous	4,366	1,159	26	6	22

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

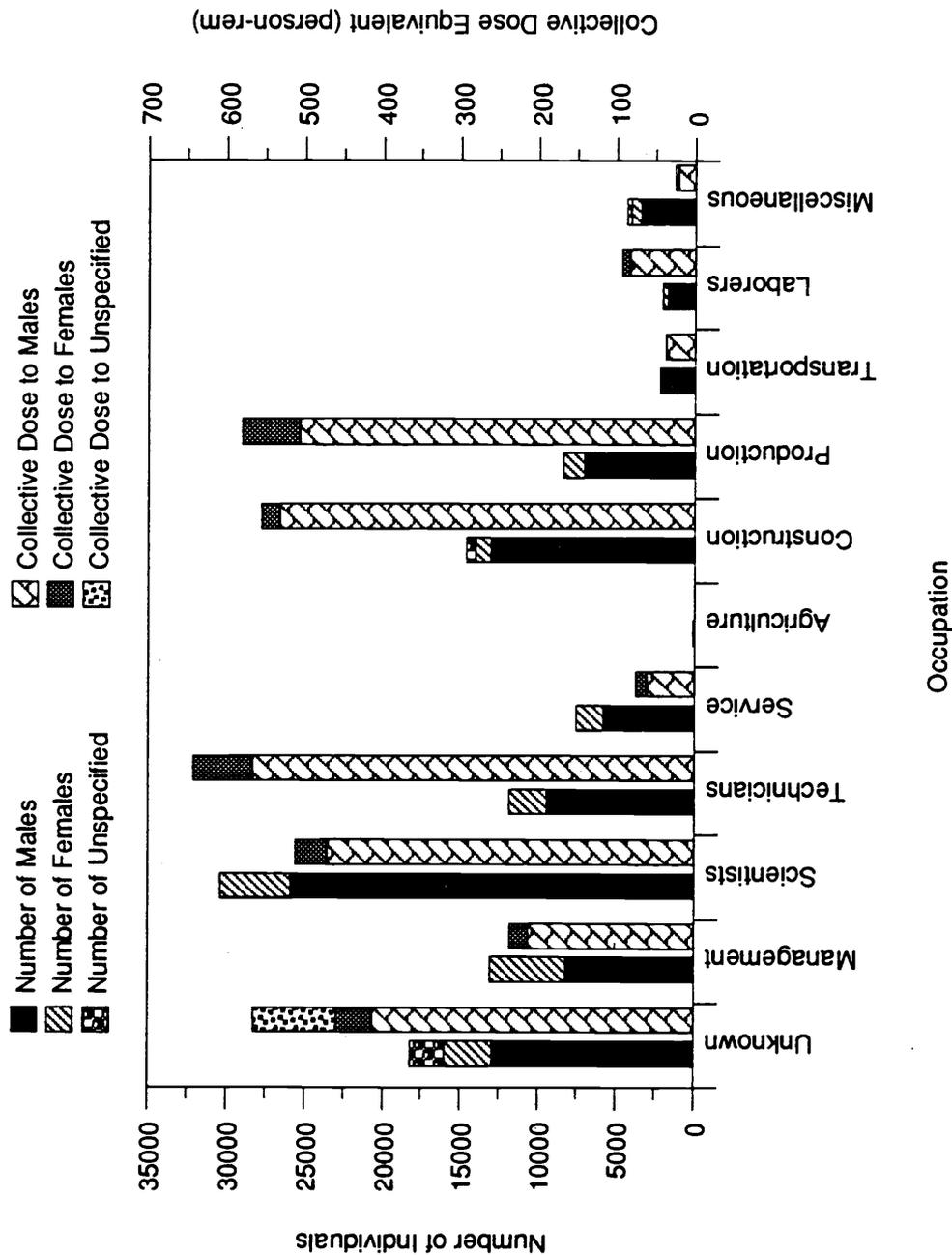


FIGURE 4.7. Penetrating Doses Received by DOE and DOE Contractor Employees and Visitors by Occupation, 1990

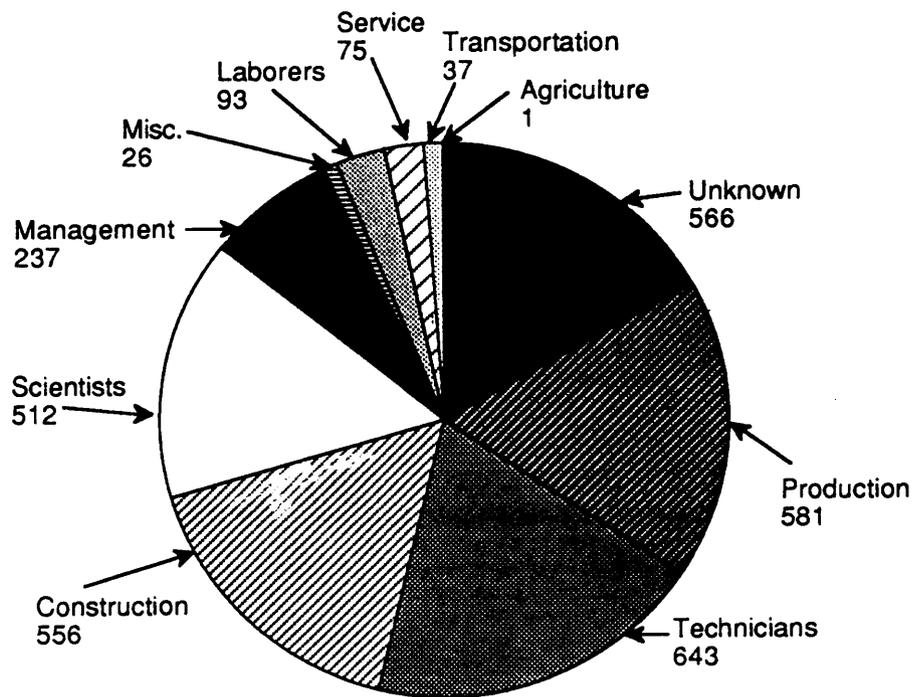


FIGURE 4.8. Contribution of Each Occupation Category to the Total Collective Dose Equivalent, 1990 (numbers indicate person-rem)

Table 4.10 lists the number of individuals who received various penetrating dose equivalents by age and sex. The age group having the most monitored individuals was the 35-39 group; the age group having the fewest was the 19-or-less group. Table 4.11 presents similar data by collective dose equivalent rather than by number of monitored individuals. Again, the age group receiving the highest collective dose equivalent was the 35-39 age group; the lowest was the 19-or-less group. Figure 4.9 illustrates the number of individuals by sex who received penetrating dose equivalents in various dose-equivalent ranges. Figure 4.10 illustrates the number of individuals by sex and age range who were monitored for ionizing radiation in 1990.

TABLE 4.9. Number of Monitored DOE/DOE Contractor Employees and Visitors by Occupation and Facility Type, 1990^(a)

Facility Type	Total Persons Monitored	Unknown	Management	Scientists	Technicians	Service	Agriculture	Construction	Production	Transportation	Laborers	Miscellaneous	Total Person-rem
Accelerator	5,948	1,3356	202	2,258	1,506	164	18	144	104	34	1	182	145
Fuel/Uranium Enrichment	6,347	347	1,254	1,363	681	424	1	1,062	879	49	210	77	62
Fuel Fabrication	3,438	41	408	1,049	326	158	0	945	341	44	104	22	69
Fuel Processing	3,852	9	520	1,580	247	72	1	517	808	45	24	29	292
Maintenance and Support	27,762	5,519	3,430	3,750	1,897	1,586	25	8,400	1,287	769	1,035	64	595
Reactor	6,230	24	916	2,456	608	151	0	676	843	87	65	404	389
Research, General	18,124	3,740	1,419	6,525	2,440	663	11	521	382	58	127	2,238	446
Research, Fusion	1,167	127	106	472	231	54	0	106	32	0	1	38	8
Waste Proc./Management	5,450	128	791	1,642	850	369	0	768	621	174	592	48	167
Weapons Fabrication and Testing	18,565	3,464	2,710	4,481	2,121	1,009	0	1,134	2,807	415	298	126	860
Other	16,140	3,510	1,334	4,827	991	2,898	67	355	298	557	165	1,138	295
Total Persons Monitored	113,023	18,244	13,090	30,403	11,898	7,548	123	14,628	8,402	2,232	2,069	4,366	
Total Person-rem		566	237	512	643	75	0	556	581	37	96	23	3,327

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

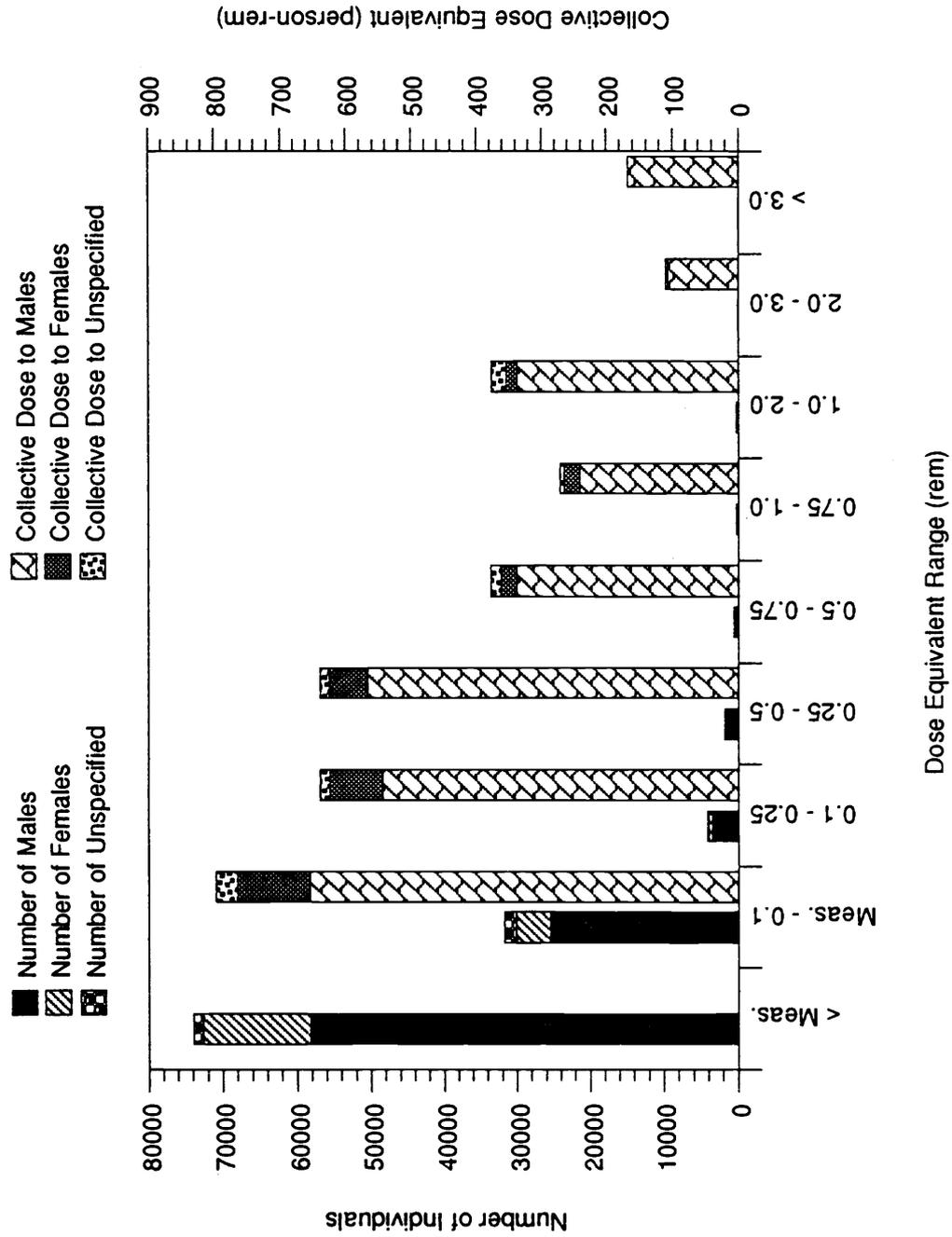


FIGURE 4.9. Distribution of Penetrating Dose Equivalents by Sex and Dose-Equivalent Range for DOE and DOE Contractor Employees and Visitors, 1990

TABLE 4.10. Distribution of Total Effective Dose Equivalent by Number of Monitored Individuals for Age, Sex, and Exposure Ranges for DOE and DOE Contractor Employees and Visitors, 1990^(a)

Age Range	Sex	<Meas.	Meas. -		0.10-0.25		0.25-0.50		0.50-0.75		0.75-1.0		1.0-2.0		2.0-3.0		3.0-4.0		4.0-5.0		> 5.0		Total
			0.10	0.25	0.25	0.50	0.50	0.75	1.0	2.0	3.0	4.0	5.0	> 5.0									
≤19	M	246	71	4	1																	322	
	F	156	28	1																		185	
	U	14																				14	
20-24	M	2,331	1,071	119	47	20	4	2														3,594	
	F	1,185	366	32	8	3	4															1,598	
	U	10	1																			11	
25-29	M	5,567	2,939	444	220	67	18	16	1													9,272	
	F	2,053	740	97	27	7	4	2														2,930	
	U	8	6																			14	
30-34	M	8,374	4,277	624	292	91	48	27	4													13,737	
	F	2,584	951	117	42	8	8	2														3,712	
	U	6	7		1																	14	
35-39	M	9,191	4,374	639	236	106	51	47	7	1												14,652	
	F	2,511	847	103	28	10	7	1														3,507	
	U	7																				7	
40-44	M	8,930	3,947	503	230	84	39	32	3													13,768	
	F	2,079	636	80	27	4	4	1														2,831	
	U	8																				8	
45-49	M	6,917	2,809	382	190	46	37	29	5	2												10,418	
	F	1,481	375	43	14	2	1	2														1,918	
	U	3	1																			4	

TABLE 4.10. (continued)

Age Range	Sex	<Meas.	Meas.- 0.10	0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.0	1.0- 2.0	2.0- 3.0	3.0- 4.0	4.0- 5.0	> 5.0	Total
50-54	M	5,887	2,222	305	142	53	29	38	7	1	1	1	8,686
	F	1,013	273	27	12	5	3	3					1,333
	U	3	1										4
55-59	M	4,815	1,911	276	165	51	35	43	8	2	3	1	7,310
	F	666	176	15	4			1					862
	U	3	3					1					6
60-64	M	3,330	1,275	168	81	30	12	15	6	2	1	1	4,921
	F	341	106	8	6	1							462
	U	3	1										4
≥65	M	1,403	34277	39	15	7	4	2	3	3	3	2	1,820
	F	143	27										170
	U	49	21	7	1								78
Unknown	M	1,227	302	10	5	3	1	3	1				1,552
	F	206	35										241
	U	1,195	1,617	95	95	37	7	17	2				3,057
Total	M	58,218	25,540	3,513	1,624	558	278	254	45	8	8	6	90,052
	F	14,418	4,560	523	168	40	28	12					19,749
	U	1,309	1,718	102	39	27	7	17	2				3,221

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE 4.11. Collective Dose Equivalent by Age, Sex, and Exposure Range, 1990^(a)

Age Range	Sex	<Meas.	Meas. -		0.10-		0.25-		0.50-		0.75-		1.0-		2.0-		3.0-		4.0-		5.0-		Total Person-rem	Average Dose per Individual Who Received a Measurable Exposure (mrem)
			0.10	0.25	0.10	0.25	0.25	0.50	0.50	0.75	0.75	1.0	1.0	2.0	2.0	3.0	3.0	4.0	4.0	5.0	5.0			
≤19	M	0	2																			2	26	
	F	0																				0	0	
	U	0																				0	0	
20-24	M	0	26	19	16	12	3	3														78	62	
	F	0	7	5	3	2	3															20	48	
	U	0																				0	0	
25-29	M	0	75	70	70	41	16	23	2													302	82	
	F	0	16	15	9	4	3	3														50	57	
	U	0																				0	0	
30-34	M	0	112	97	103	56	42	34	9													452	84	
	F	0	23	17	15	5	7	2														69	61	
	U	0																				0	0	
35-39	M	0	114	98	82	64	45	61	16	3												483	88	
	F	0	22	16	9	6	6	2														61	61	
	U	0																				-0	0	
40-44	M	0	102	79	81	50	33	41	7													392	81	
	F	0	15	12	9	2	4	2														44	59	
	U	0																				0	0	
45-49	M	0	73	58	67	28	32	40	12	7												321	92	
	F	0	10	6	5	1	1	3														26	59	
	U	0																				0	0	

TABLE 4.11. (continued)

Age Range	Sex	<Meas.	Meas. -		0.10-		0.25-		0.50-		0.75-		1.0-		2.0-		3.0-		4.0-		Total Person-rem	Average Dose per Individual Who Received a Measurable Exposure (mrem)
			0.10	>0.10	0.25	>0.25	0.50	>0.50	0.75	>0.75	1.0	>1.0	2.0	>2.0	3.0	>3.0	4.0	>4.0				
50-54	M	0	56	46	49	33	26	50	18	3	5	7	293	105								
	F	0	7	4	4	3	4	22	69													
	U	0										0	0									
55-59	M	0	49	42	57	31	31	59	19	7	13	15	323	129								
	F	0	5	2	2	2	2	2	10	51												
	U	0										0	0									
60-64	M	0	32	16	29	18	10	22	14	7	5	8	171	107								
	F	0	3	1	2	1	1	7	8													
	U	0										0	0									
≥65	M	0	8	6	5	4	3	2	8	0	13	17	68	163								
	F	0	1										1	37								
	U	0	1	1									2	69								
Unknown	M	0	6	2	2	2	1	4	2				18	55								
	F	0	1										1	28								
	U	0	31	14	14	16	6	23	4				108	58								
Total	M	0	655	544	567	338	241	337	106	27	37	52	2,904	91								
	F	0	110	80	58	24	24	17					312	58								
	U	0	33	15	14	16	6	23	4				111	58								

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

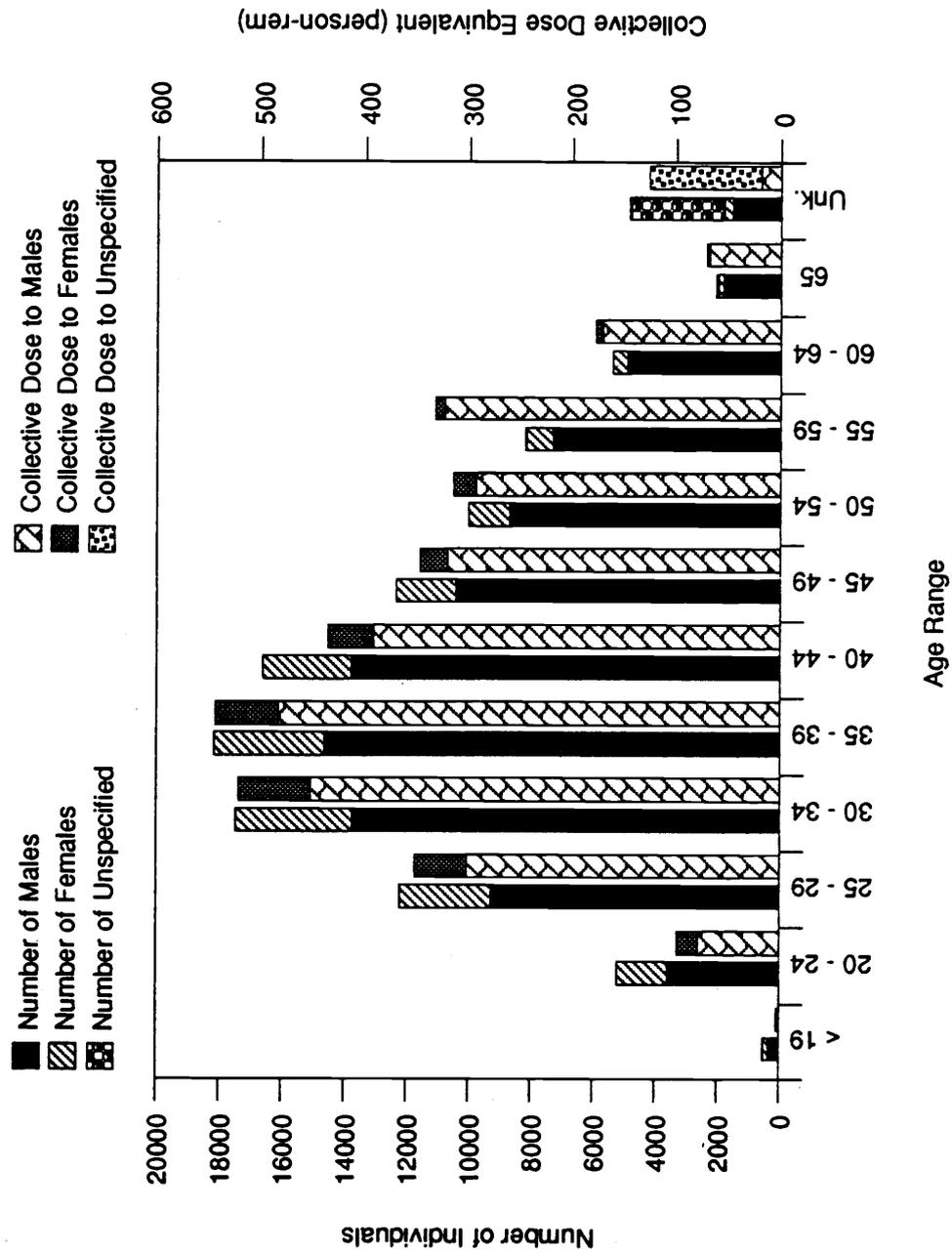


FIGURE 4.10. Number of Individuals (Employees and Visitors) Monitored and Collective Dose Equivalent by Age Range and Sex, 1990

Table 4.12 lists the number of individuals monitored, the numbers of individuals monitored who received a measurable exposure, and the collective and average dose equivalents received by age range. The age group receiving the highest average dose equivalent per individual monitored was the 55-59 age group (41 mrem) (0.41 mSv); the age group receiving the lowest was the 19-or-less group (4 mrem) (0.04 mSv). The age group receiving the highest average dose equivalent per individual who received a measurable exposure was the 65-and-greater age group (150 mrem) (1.50 mSv); the lowest was the 19-or-less group (19 mrem) (0.19 mSv).

Table 4.13 presents similar data by sex rather than age. Males received approximately 90% of the collective dose equivalent received by individuals for whom sex was specified. Males also received higher average dose equivalents per individual monitored than did females (32 mrem versus 16 mrem) (0.32 mSv versus 0.16 mSv) as well as higher average dose equivalents per individual monitored who received a measurable exposure (91 mrem (0.91 mSv) versus 59 mrem (0.59 mSv)). Internal dose contributions (due to past uptakes) to the total effective dose equivalent quantity are the reason the 65-and-greater age group had the highest average dose equivalent per individual who received a measurable exposure.

Because of the sensitivity of the fetus to ionizing radiation, which is greater than that of children or adults, it is important to evaluate the doses received by women of child-bearing age. Table 4.14 presents the number of women of child-bearing age (arbitrarily assumed to include women up to the age of 44) who received a measurable dose equivalent in 1990, by facility type. A total of 4,195 women of child-bearing age received a collective dose equivalent of 246 person-rem (2.46 person-Sv). The average individual dose equivalent for these women over all facilities was 59 mrem (0.59 mSv).

TABLE 4.12. Number of Individuals Monitored and Average Penetrating Total Effective Dose Equivalent by Age, 1990^(a)

<u>Age Range</u>	<u>Number of Individuals Monitored</u>	<u>Number of Individuals Who Received a Measurable Exposure</u>	<u>Collective Dose Equivalent (person-rem)</u>	<u>Average Dose Equivalent per Individual Monitored (mrem)</u>	<u>Average Dose Equivalent per Individual Monitored Who Received a Measurable Exposure (mrem)</u>
≤19	521	105	2	4	19
20-24	5,203	1,677	98	19	58
25-29	12,216	4,588	352	29	77
30-34	17,463	6,499	521	30	80
35-39	18,166	6,457	544	30	84
40-44	16,607	5,590	436	26	78
45-49	12,340	3,939	347	28	88
50-54	10,023	3,120	315	31	101
55-59	8,178	2,694	333	41	124
60-64	5,387	1,713	178	33	104
≥65	2,068	473	71	34	150
Unspecified	<u>4,850</u>	<u>2,222</u>	<u>127</u>	<u>26</u>	<u>57</u>
All Individuals	113,022	39,077	3,327	29	85

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE 4.13. Number of Individuals Monitored and Average Total Effective Dose Equivalent by Sex, 1990^(a)

	<u>Number of Individuals Monitored</u>	<u>Number of Individuals Who Received a Measurable Exposure</u>	<u>Collective Dose Equivalent (person-rem)</u>	<u>Average Dose Equivalent per Individual Monitored (mrem)</u>	<u>Average Dose Equivalent per Individual Monitored Who Received a Measurable Exposure (mrem)</u>
Male	90,052	31,834	2,904	32	91
Female	19,749	5,331	312	16	59
Unspecified	3,221	1,912	111	34	58
All Individuals	113,022	39,077	3,327	29	85

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE 4.14. Total Effective Dose Equivalent Received by Female Employees and Visitors of Childbearing Age, 1990^(a)

Facility Type	Persons	Number of Females Receiving Measurable Doses in Each Age Group						Total Person-rem
		≤19	20-24	25-29	30-34	35-39	40-44	
Accelerator	116	5	19	25	28	20	19	8
Fuel/Uran. Enrichment	255		13	41	72	83	46	6
Fuel Fabrication	98		4	15	29	24	26	10
Fuel Processing	230	1	23	43	73	55	35	33
Maint. and Support	1,033	8	122	250	267	207	179	63
Reactor	236		31	61	66	41	37	15
Research, General	423	3	32	93	118	122	55	34
Research, Fusion	4				1		3	
Waste Proc./Management	275	2	24	66	72	74	37	15
Weapons Fab. & Test.	926	7	39	116	257	261	246	43
Other	599	3	106	167	145	109	69	17
Total Persons	4,195	29	413	877	1,128	996	752	
Total Person-rem		0	20	50	69	61	44	246

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

Figure 4.11 presents the age distributions of both the number of workers and collective dose equivalents for males and females. As indicated by the ages pertaining to the 50% mark on the figure, the median ages for monitored workers at DOE facilities were approximately 37 and 42 for females and males, respectively. The median ages for collective dose equivalent were approximately 36 and 42, respectively, indicating that, in general, younger workers receive slightly higher doses than do older workers.

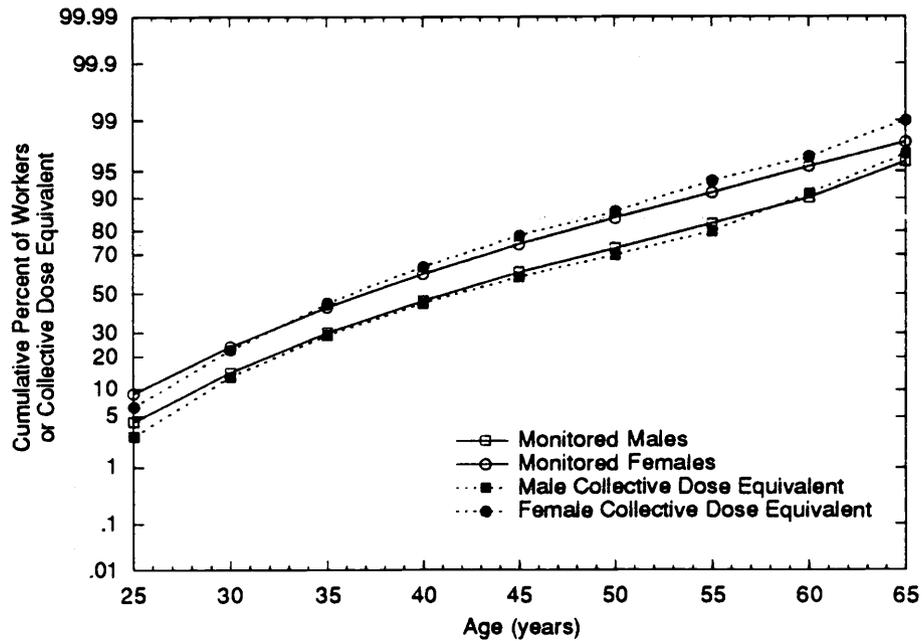


FIGURE 4.11. Number of Individuals (Employees and Visitors) Monitored and Collective Dose Equivalent by Age Range and Sex, 1990

4.6 DISTRIBUTION BY TYPE OF EXPOSURE

For calendar year 1990, DOE Order 5484.1 required that specific information on the types of radiation doses received by each worker be reported. Specifically, these included the total effective dose equivalent, the external penetrating dose equivalent (at a depth in tissue of 1.0 cm) including neutron exposure, the dose equivalent from neutron exposure only, the internal effective dose equivalent, the shallow dose equivalent, and the extremity dose equivalent. From these data, the external penetrating beta-gamma dose equivalent can be derived by subtracting the neutron dose equivalent from the external penetrating dose equivalent including neutron exposure. That is, the two

contributors to external penetrating dose equivalent are beta-gamma radiation and neutron radiation. The Order does not require reports of dose to the eye.

Table 4.15 lists the various types of dose equivalents received by facility type. Of the total effective dose equivalent of 3,327 person-rem (33.27 person-Sv) received, 2,545 person-rem (25.45 person-Sv (76%)) were attributable to total penetrating radiation and 838 person-rem (8.38 person-Sv (25%)) were attributable to internal radiation. When added, the penetrating and internal collective dose equivalent values exceed the collective dose value of total effective dose equivalent. This is due to reporting errors from some of the DOE sites. Of the total external penetrating dose equivalent of 2,545 person-rem (25.45 person-Sv), 2,164 person-rem (21.64 person-Sv (85%)) were attributable to beta-gamma radiation and 381 person-rem (3.81 person-Sv (15%)) were attributable to neutron radiation. Neutron radiation contributed the highest percentage (30%) of the total penetrating dose equivalent at general research facilities. The total shallow dose reported to have been received was 3,354 person-rem (33.54 person-Sv). Relative to the total penetrating dose equivalent, the total shallow dose equivalent was greatest at weapons fabrication and testing facilities, where the shallow dose equivalent exceeded the penetrating dose equivalent by a factor of 2.5. However, because the critical organ regarding shallow dose equivalents is the skin and because the radiation risk coefficient for induction of fatal skin cancers is low (NCRP 1987a), the penetrating dose equivalents are of the most concern regarding health effects. Collective extremity dose equivalents were 2,397 person-rem (23.97 person-Sv) to the hand and arm and 806 person-rem (8.06 person-Sv) to the foot and leg. Exposure of the hand and arm accounted for 75% of the total extremity collective dose while foot and leg exposure accounted for 25% of the overall extremity exposure. The total extremity collective dose equivalent exceeded the total penetrating collective dose equivalent by 26% (658 person-rem (6.58 person-Sv)).

A detailed comparison of the dose equivalent quantities by sex, age range, occupation, and facility type can be found in Section 5.0 of this report. The magnitude of the postulated health effects from radiation doses received at DOE facilities is discussed in Section 7.0 of this report.

TABLE 4.15. Dose Equivalent by Dose-Equivalent Type (person-rem)^(a)

Facility Type	Total Effective Dose Equivalent	Internal			Penetrating			Extremity	
		Internal	Total	Beta-Gamma	Neutron	Shallow	Arm & Hand	Leg & Foot	
Accelerator	145	0	145	112	32	123	48	43	
Fuel/Uran. Enrich.	62	10	51	50	1	117	39	26	
Fuel Fab.	69	4	66	66	0	90	17	1	
Fuel Process.	292	10	283	248	36	430	148	12	
Maintenance & Support	595	48	546	476	70	644	313	142	
Reactor	389	15	388	383	5	420	194	64	
Research, Gen.	446	79	406	283	122	373	532	121	
Research, Fusion	8	0	7	7	0	7	1	0	
Waste Proc./Mgmt.	167	18	149	106	43	163	221	114	
Weapons Fab. & Testing	860	642	216	171	47	542	713	241	
Other	<u>295</u>	<u>10</u>	<u>286</u>	<u>262</u>	<u>23</u>	<u>443</u>	<u>171</u>	<u>43</u>	
Total	3,328	836	2,543	2,164	379	3,354	2,397	806	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

4.7 EVALUATION OF TRENDS

Doses received by DOE and DOE contractor employees and visitors have decreased dramatically over the last several years (see Table 4.7). For example, in 1985 the collective dose equivalent received by employees and visitors was 8,684 person-rem (86.84 person-Sv); in 1990, this value was 3,327 person-rem (33.27 person-Sv). Some of this decrease is attributable to the fact that the 1985 value was estimated from the numbers of individuals reported to have received doses in various dose-equivalent ranges. Previous to the 1987 reporting period, collective dose equivalents were calculated by multiplying the number of individuals who received dose equivalents in various dose-equivalent intervals by the midpoint of those intervals and summing the products. However, the majority of the decrease is attributable to other factors.

The most evident example of the recent dramatic decrease in collective doses is at the Richland Field Organization. In 1987, the collective dose equivalent to employees and visitors at Richland was 2,477 person-rem (24.77 person-Sv); in 1990, this value dropped by over 85% to 353 person-rem (3.53 person-Sv). This decrease was primarily the result of both changes in the type of work performed and facility closures. Decreases also occurred from 1986 to 1990 at the Oak Ridge (-71%) and Savannah River (-47%) field organizations.

The 1990 data demonstrate that the significant decrease in collective dose equivalent is not attributable to fewer individuals being monitored, but to lower doses to those individuals who are monitored. Figure 4.12 illustrates the recent dramatic decrease in average annual dose equivalent per individual monitored who received a measurable exposure. Table 4.16 lists similar data for each facility type. Table 4.17 lists collective dose equivalent by facility type for the years 1980 through 1990.

One correlative effect of lower average individual dose equivalents is fewer employees who exceed various dose-equivalent levels. Figure 4.13 illustrates the number of employees who received dose equivalents greater than 0.5 rem (5 mSv), 1.0 rem (10 mSv), or 2.0 rem (20 mSv) from 1980 to 1990. As indicated in the figure, the numbers decreased significantly during the 1988-1990 time period. As a result, fewer employees are being exposed to doses that are significant fractions of the annual dose limit.

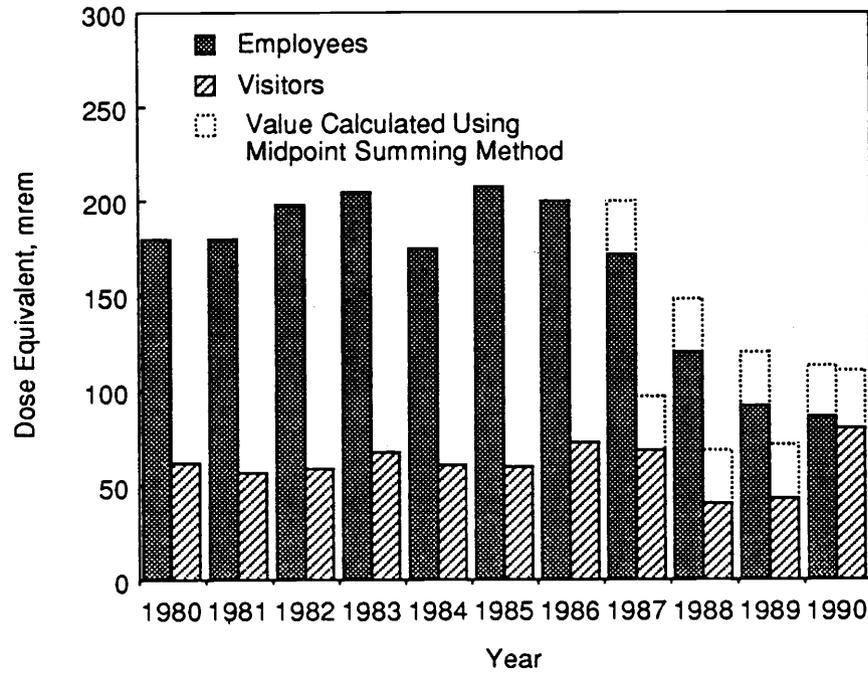


FIGURE 4.12. Average Dose Equivalent per Individual Who Received a Measurable Exposure, 1980-1990

TABLE 4.16. Average Dose Equivalent per Individual Who Received a Measurable Exposure by Facility Type, (a) 1980-1990 (mrem)

Year	Reactor	Fuel Fab.	Fuel Proc.	Uran. Enrichment	Weapons Fab. & Test.	Gen. Research	Accelerator	Other	Visitors	DOE Offices	All Facilities
1980	278	236	442	117	120	120	209	217	59	57	157
1981	270	246	412	74	129	140	228	202	57	59	156
1982	302	306	362	86	136	168	209	169	58	62	164
1983	313	322	298	79	149	169	219	202	66	57	190
1984	323	283	294	80	147	154	196	164	60	62	167
1985	323	226	318	63	170	193	175	188	59	63	182
1986	300	227	314	71	166	211	129	185	71	65	179
1987	239	155	267	37	183	150	98	173	69	30	159
1988	104	112	217	29	139	124	114	100	39	19	103
1989	92	68	259	28	105	97	116	69	43	21	84
1990	61	84	170	28	46	90	87	65	81	16	72
1990 (b)	68	87	176	26	112	102	87	68	80	22	85

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

Beginning in 1987, three facility categories were added to those listed in the table: maintenance and support, fusion research, and waste processing/management. For this table, these facility categories are included in the "other" category for 1987-1989.

(b) Total effective dose equivalent for 1990. All other data in this table describe whole-body penetrating dose exposure.

TABLE 4.17. Collective Dose Equivalent^(a) by Facility Type, ^(b) 1980-1990 (person-rem)

Year	Reactor	Fuel Fab.	Fuel Proc.	Uran. Enrichment	Weapons Fab. & Testing	Gen. Research	Accelerator	Other	Visitors	DOE Offices	All Facilities
1980	1,185	323	1,047	156	869	1,611	412	1,773	619	29	8,024
1981	1,270	267	592	62	982	1,535	348	1,813	571	38	7,483
1982	1,612	411	735	30	1,056	1,676	254	1,293	686	26	7,879
1983	1,781	434	726	31	1,399	1,662	273	1,522	300	30	8,158
1984	1,620	264	515	28	1,672	1,736	248	1,944	368	30	8,423
1985	1,716	265	574	26	1,851	1,484	262	2,025	461	20	8,684
1986	1,391	356	598	39	1,802	1,357	232	2,117	554	20	8,465
1987	1,007	271	426	41	1,028	769	169	2,260	373	8	6,353
1988	366	171	374	32	767	554	194	1,195	245	5	3,901
1989	329	77	491	41	512	508	184	928	303	3	3,375
1990	183	59	282	47	197	398	127	777	471	3	2,545
1990 ^(c)	184	63	292	57	839	439	127	849	472	4	3,327

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.
 (b) Beginning 1987, three facility categories were added to those listed in the table: maintenance and support, fusion research, and waste processing/management. For this table, these facility categories are included in the "other" category for 1987-1989.
 (c) Total effective dose equivalent for 1990. All other data in this table describe whole-body penetrating dose exposure.

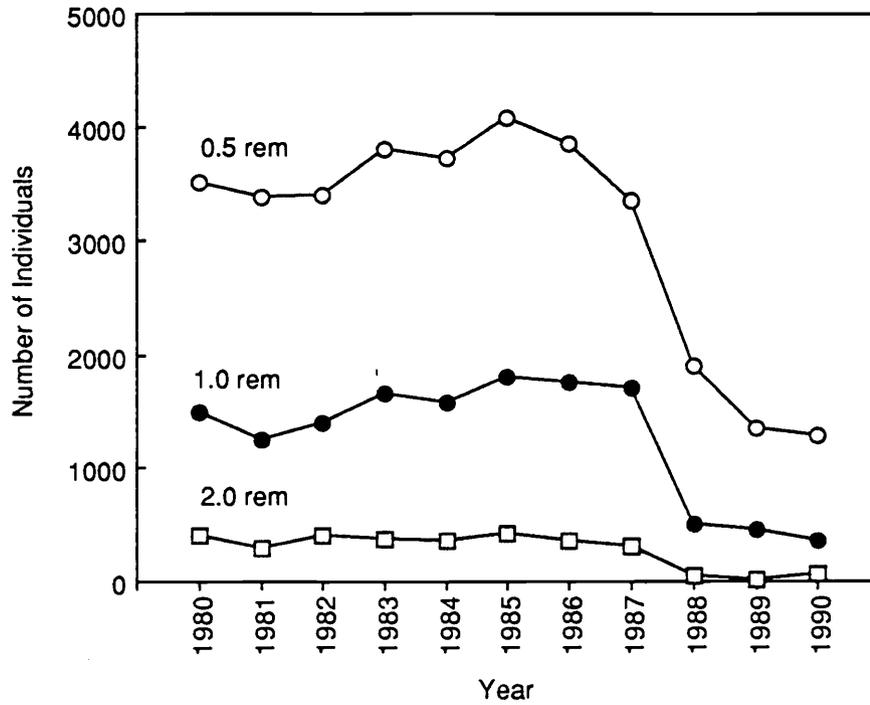


FIGURE 4.13. Number of Employees Who Received Dose Equivalents Greater Than 0.5 rem, 1 rem, and 2 rem, 1980-1990

5.0 ADDITIONAL NEW DOSE REPORTING QUANTITIES

As mentioned earlier, this report is the first to report the complete data for all dose reporting quantities required in DOE Order 5484.1. These dose reporting quantities include total effective dose equivalent, annual internal dose equivalent, arm and hand extremity dose equivalent, and leg and foot extremity dose equivalent. This section will highlight and compare these dose quantities to the whole-body penetrating dose equivalent quantity.

The total effective dose equivalent quantity is the sum of the whole-body penetrating dose equivalent and annual internal dose equivalent. In past annual reports the whole-body penetrating dose equivalent quantity was the main one reported and analyzed. Previous to this report, only internal depositions that exceeded 50% of the annual standard were reported.

5.1 COMPARISON OF TOTAL EFFECTIVE DOSE EQUIVALENT, PENETRATING DOSE EQUIVALENT, AND INTERNAL DOSE EQUIVALENT

Figures 5.1 through 5.9 highlight the total effective dose equivalent and internal dose equivalent quantities. These quantities are compared to the penetrating dose equivalent primarily reported in the past. The average value for these quantities is shown for the age, sex, occupation, and facility categories described in Section 4.0.

5.1.1 Comparison by Age Range and Sex

Comparisons of total effective dose equivalent, penetrating dose equivalent, and internal dose equivalent by age range and sex are shown in Figures 5.1 through 5.3. Figure 5.1 illustrates the average values for the dose equivalent quantities by age range for all DOE and DOE contractor employees and visitors. The average quantities are shown in Figures 5.2 and 5.3 for male and female employees and visitors, respectively. Average total effective dose equivalent and penetrating dose equivalent values are generally highest for employees and visitors in the age ranges 30 to 40 and 50 to 65. Older male employees have much higher average internal dose equivalent values due to past internal uptakes of radioactive material. A similar trend is seen for internal dose to female employees. The higher internal dose averages for older employees accounts for the increase in total

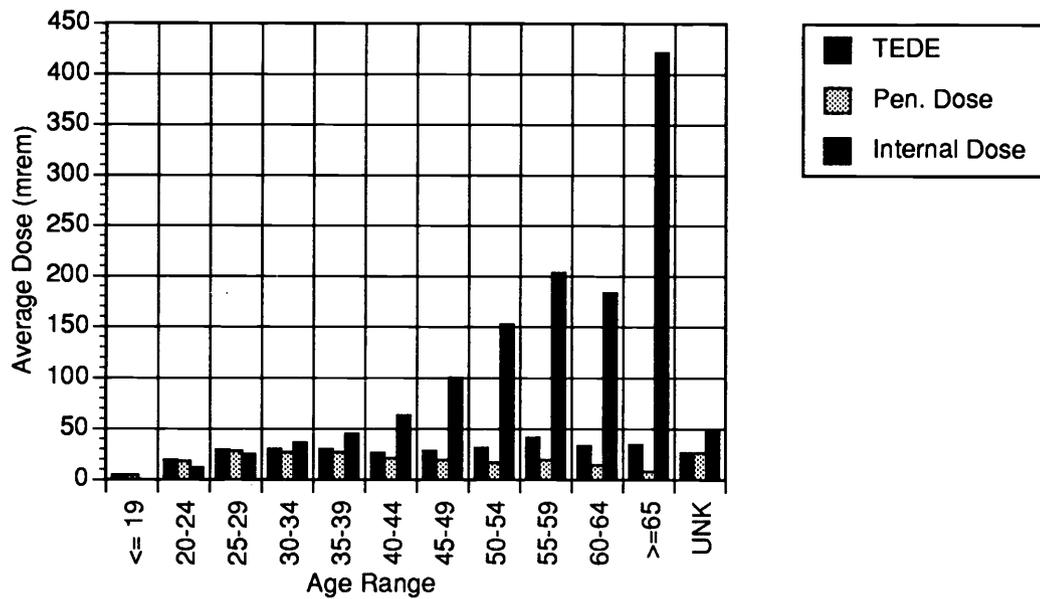


FIGURE 5.1. Comparison of Average Total Effective Dose Equivalent, Average Penetrating Dose Equivalent, and Average Internal Dose Equivalent by Age Range for All Employees and Visitors, 1990

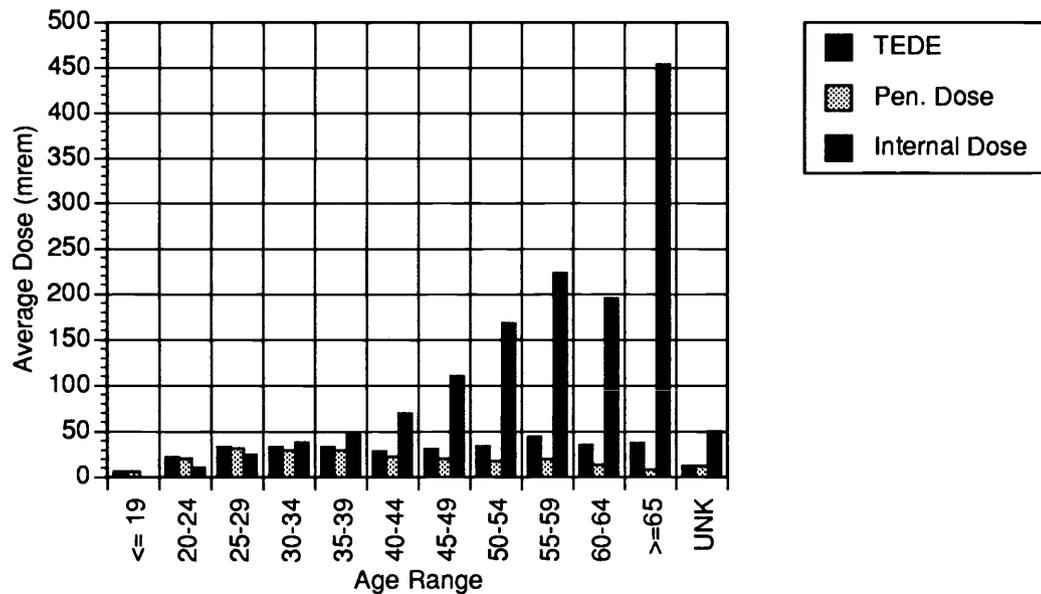


FIGURE 5.2. Comparison of Average Total Effective Dose Equivalent, Average Penetrating Dose Equivalent, and Average Internal Dose Equivalent by Age Range for Male Employees and Visitors, 1990

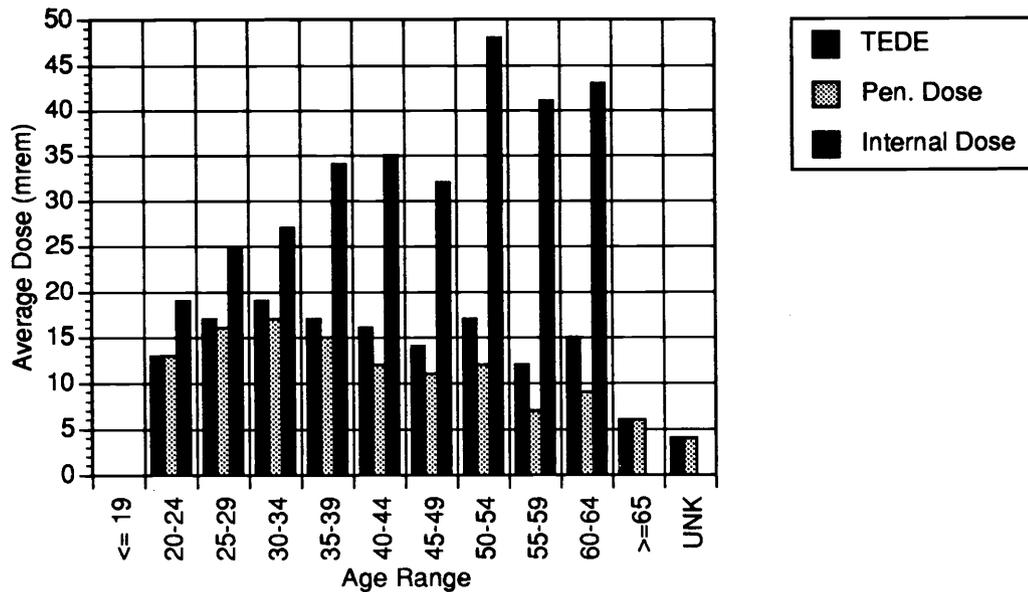


FIGURE 5.3. Comparison of Average Total Effective Dose Equivalent, Average Penetrating Dose Equivalent, and Average Internal Dose Equivalent by Age Range for Female Employees and Visitors, 1990

effective dose equivalent for older age groups. The penetrating dose equivalent average generally decreases for all employees over the age of 40.

5.1.2 Comparison by Occupation and Sex

Figure 5.4 illustrates the average dose equivalent quantities by occupation for all employees. Production workers had the highest overall average total effective dose equivalent (69 mrem (0.69 mSv)) and penetrating dose equivalent (54 mrem (0.54 mSv)). Technicians had the highest overall average internal dose equivalent (164 mrem (1.64 mSv)). Employees classified as agricultural workers had the lowest average total effective, penetrating, and internal dose equivalent values (< 1 mrem (< 0.01 mSv)). Similar data trends are shown for male and female workers in Figures 5.5 and 5.6, respectively.

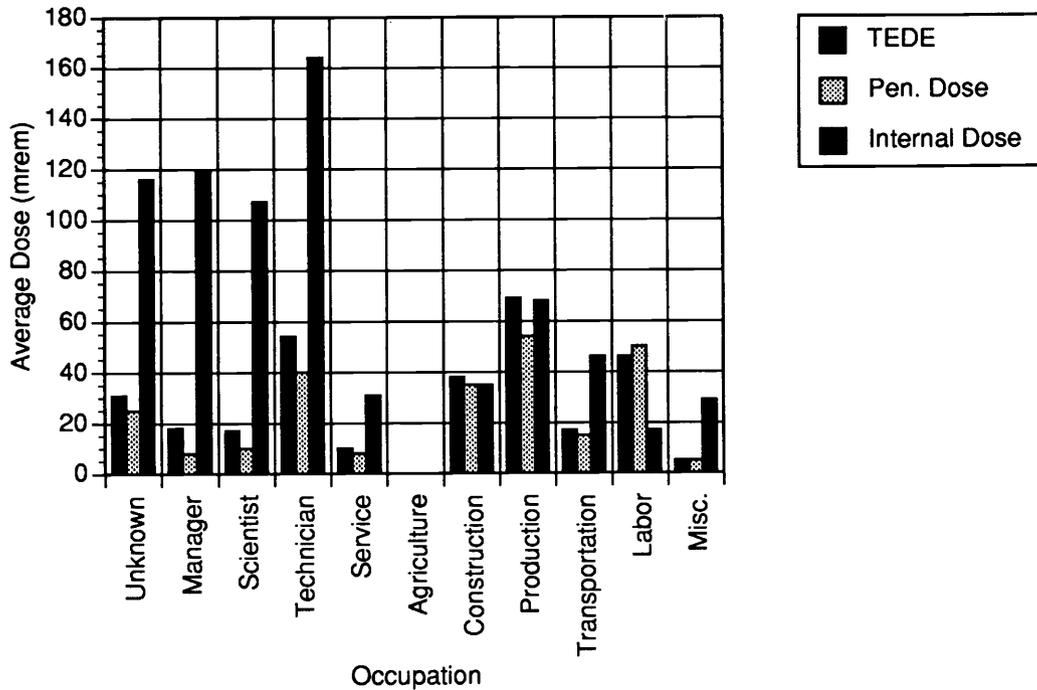


FIGURE 5.4. Comparison of Average Total Effective Dose Equivalent, Average Penetrating Dose Equivalent, and Average Internal Dose Equivalent by Occupation for All Employees and Visitors, 1990

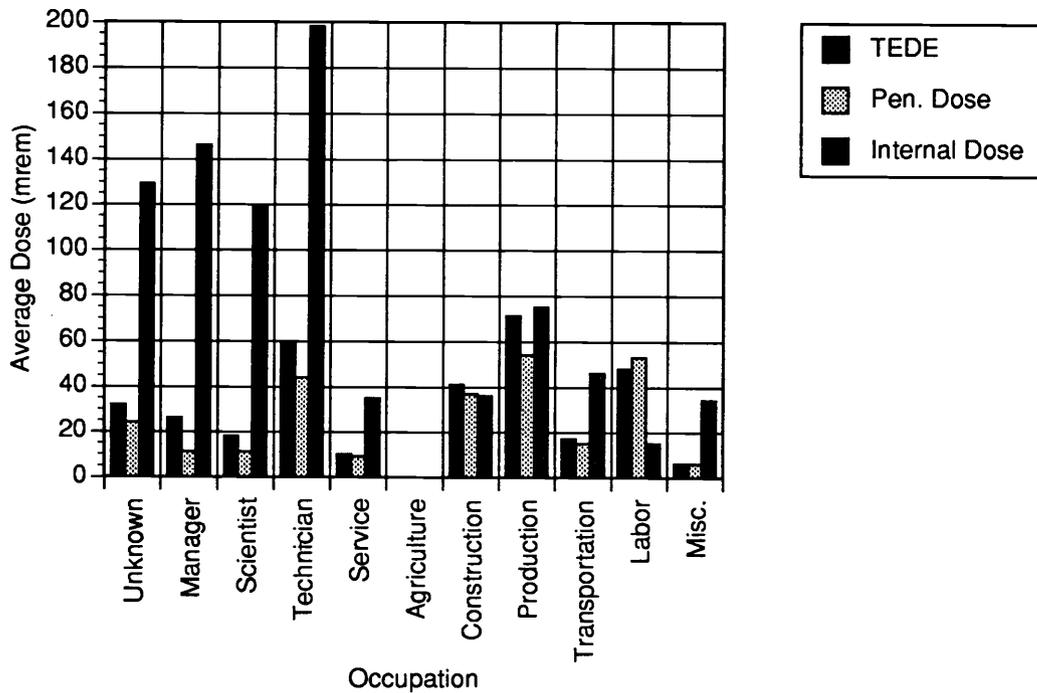


FIGURE 5.5. Comparison of Average Total Effective Dose Equivalent, Average Penetrating Dose Equivalent, and Average Internal Dose Equivalent by Occupation for Male Employees and Visitors, 1990

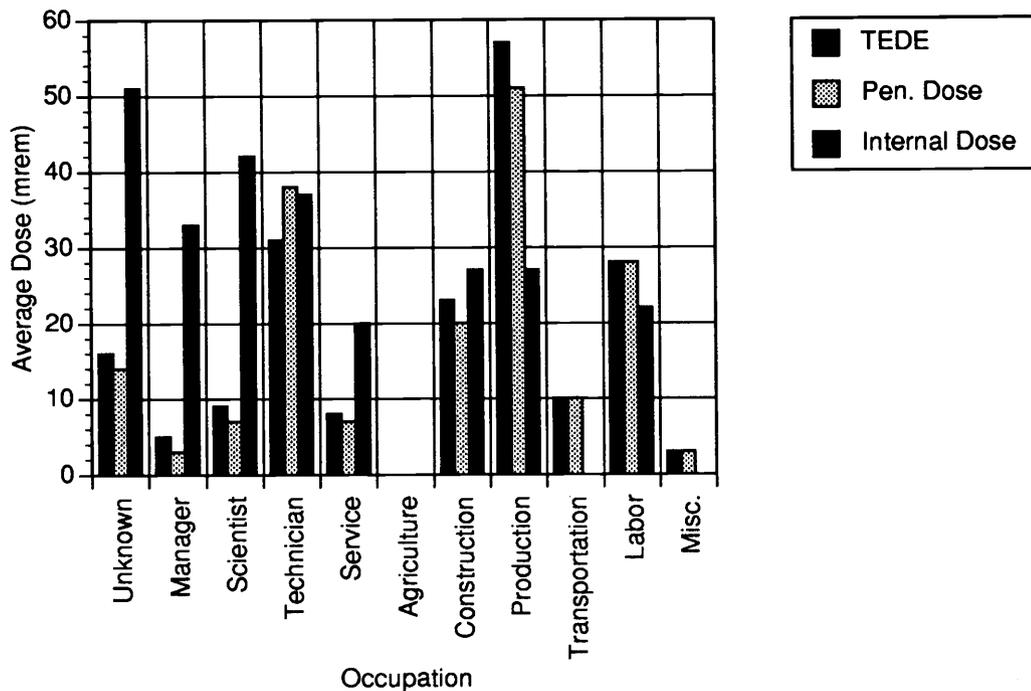


FIGURE 5.6. Comparison of Average Total Effective Dose Equivalent, Average Penetrating Dose Equivalent, and Average Internal Dose Equivalent by Occupation for Female Employees and Visitors, 1990

5.1.3 Comparison by Facility Type and Sex

Average dose equivalent values are shown for DOE facility types in Figures 5.7 through 5.9. Data shown for all employees in Figure 5.7 reveal that those working at fuel processing facilities received the highest average total effective dose equivalent (76 mrem (0.76 mSv)) and penetrating dose equivalent (73 mrem (0.73 mrem)). Employees at general research facilities received the highest average internal dose equivalent (198 mrem (1.98 mSv)). Fusion research employees received the lowest average total effective (7 mrem (0.07 mSv)), penetrating (7 mrem (0.07 mSv)), and internal dose (< 1 mrem (< 0.01 mSv)) equivalent values. Again, similar data trends were observed for the male and female components of the DOE population (Figures 5.8 and 5.9).

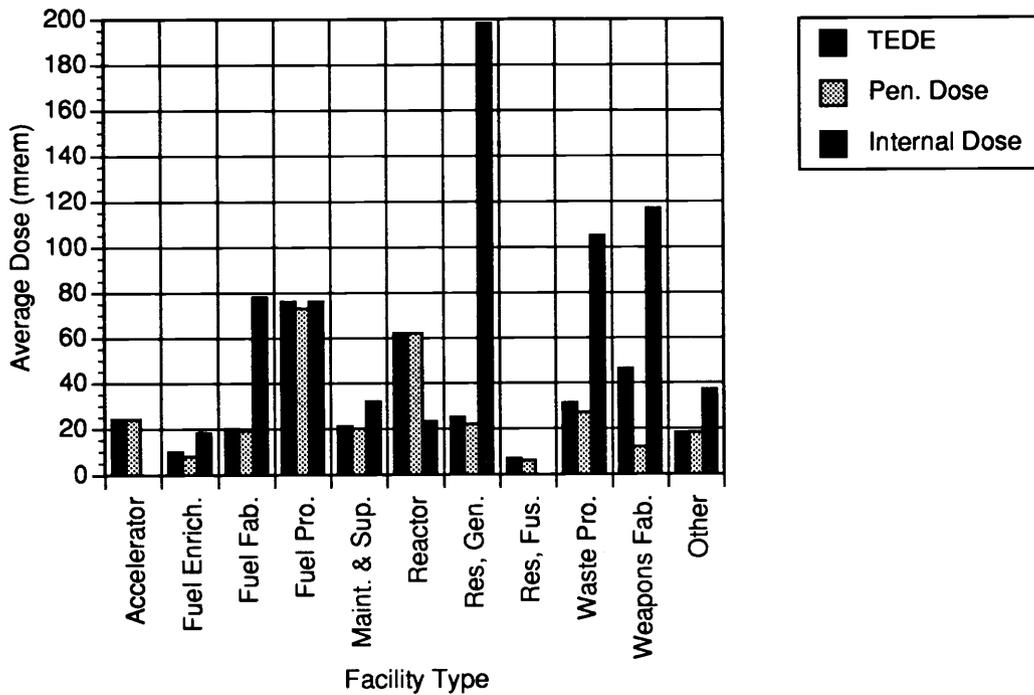


FIGURE 5.7. Comparison of Average Total Effective Dose Equivalent, Average Penetrating Dose Equivalent, and Average Internal Dose Equivalent by Facility Type for All Employees and Visitors, 1990

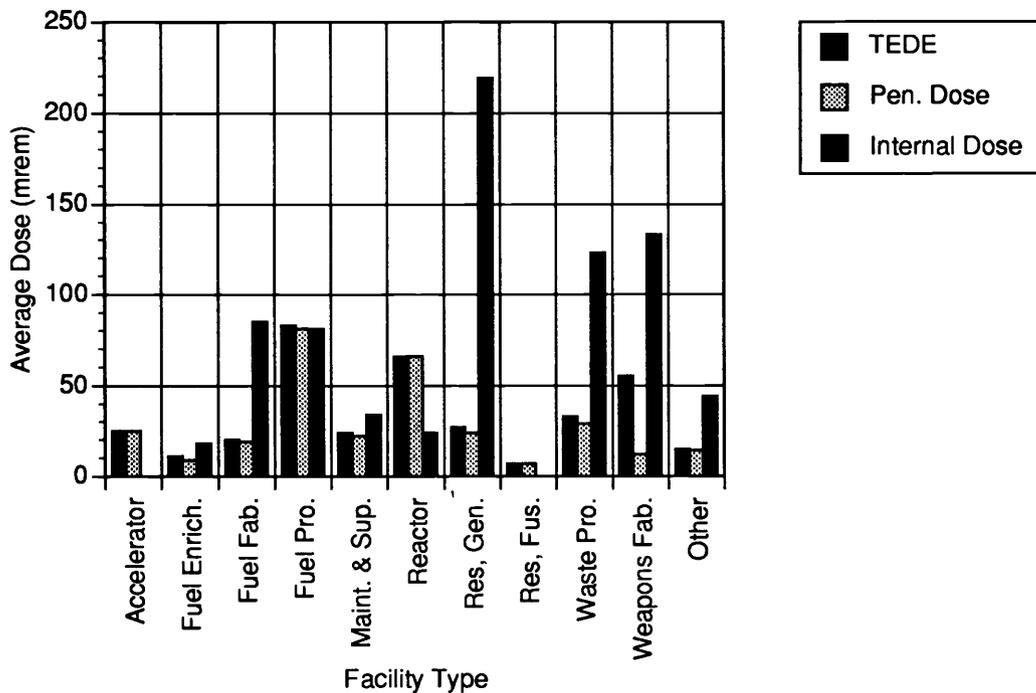


FIGURE 5.8. Comparison of Average Total Effective Dose Equivalent, Average Penetrating Dose Equivalent, and Average Internal Dose Equivalent by Facility Type for Male Employees and Visitors, 1990

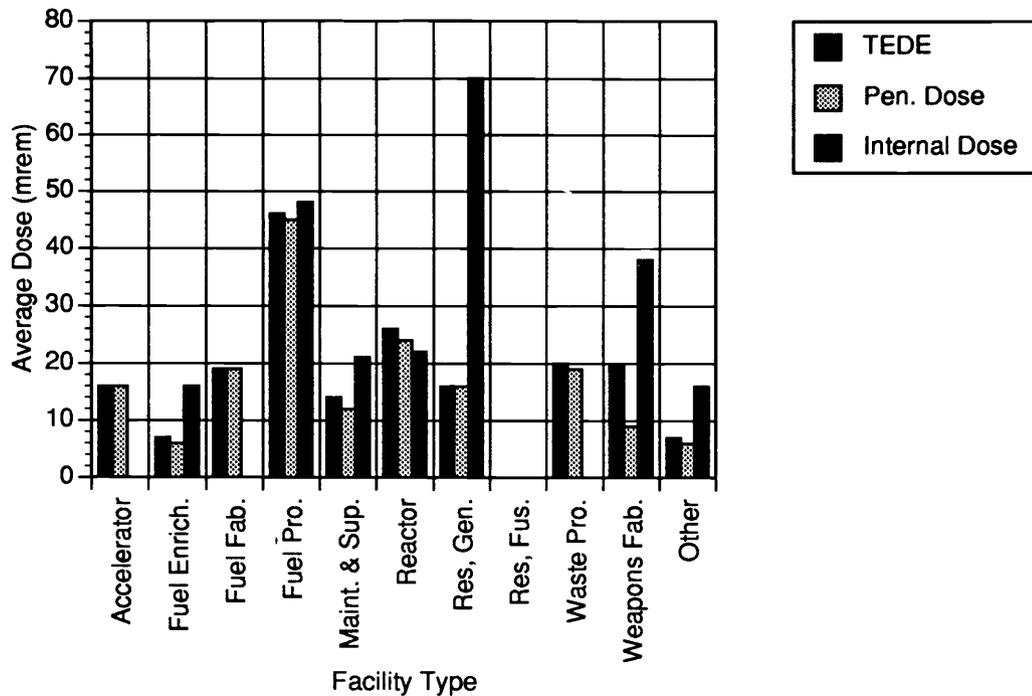


FIGURE 5.9. Comparison of Average Total Effective Dose Equivalent, Average Penetrating Dose Equivalent, and Average Internal Dose Equivalent by Facility Type for Female Employees and Visitors, 1990

5.2 COMPARISON OF PENETRATING DOSE EQUIVALENT, HAND AND ARM EXTREMITY DOSE EQUIVALENT, AND FOOT AND LEG EXTREMITY DOSE EQUIVALENT

Figures 5.10 through 5.18 highlight the hand and arm extremity dose equivalent and foot and leg dose equivalent quantities. These quantities are compared to the whole-body penetrating dose equivalent. Again, the average value for these quantities is shown for age, sex, occupation, and facility categories.

5.2.1 Comparison by Age Range and Sex

Average hand and foot extremity dose equivalent values were highest for employees between the ages of 30 and 60. There is very little variation between the data shown for all employees in Figure 5.10 and male and female employees shown in Figures 5.11 and 5.12, respectively. Also, there is little variation in the extremity exposure of the maximally exposed age groups. The average hand

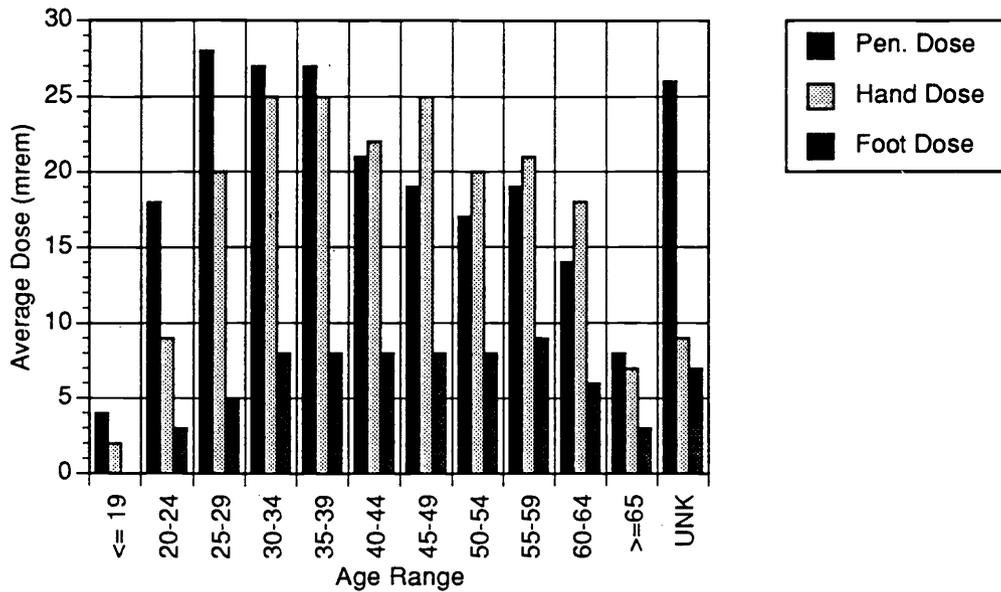


FIGURE 5.10. Comparison of Average Penetrating Dose Equivalent, Average Hand and Arm Extremity Dose Equivalent, and Average Foot and Leg Extremity Dose Equivalent by Age Range for All Employees and Visitors, 1990

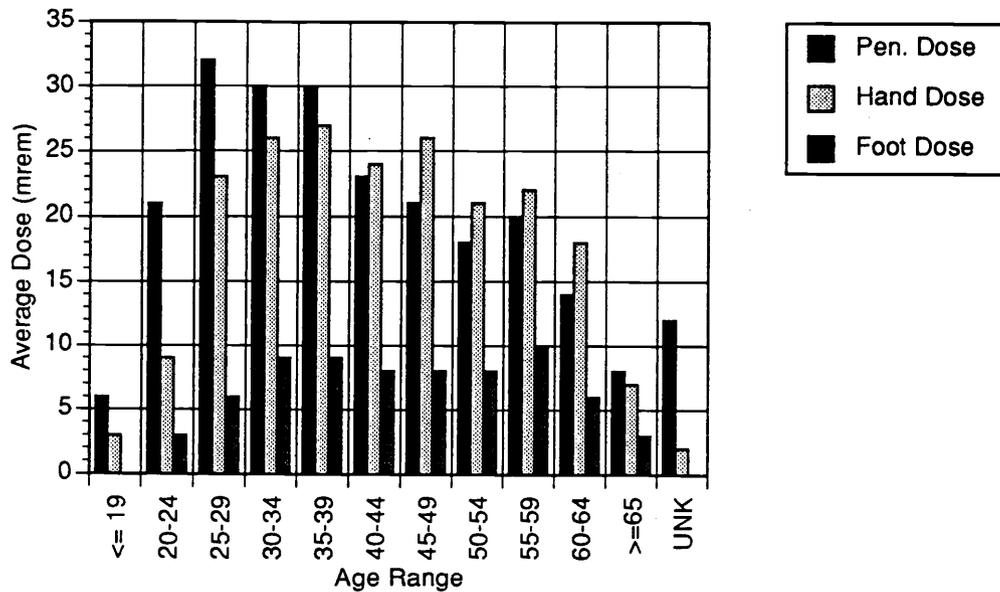


FIGURE 5.11. Comparison of Average Penetrating Dose Equivalent, Average Hand and Arm Extremity Dose Equivalent, and Average Foot and Leg Extremity Dose Equivalent by Age Range for Male Employees and Visitors, 1990

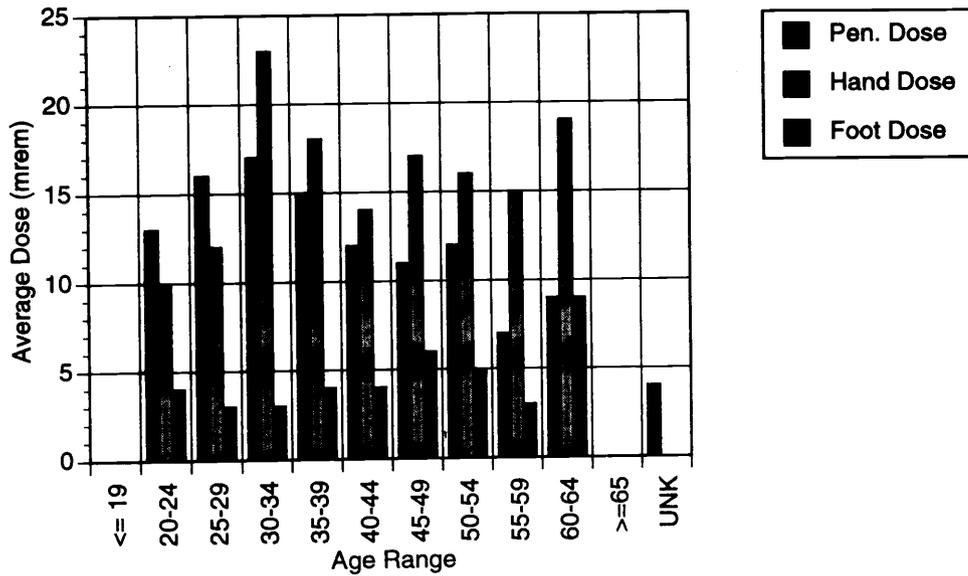


FIGURE 5.12. Comparison of Average Penetrating Dose Equivalent, Average Hand and Arm Extremity Dose Equivalent, and Average Foot and Leg Extremity Dose Equivalent by Age Range for Female Employees and Visitors, 1990

extremity dose equivalent value was approximately 23 mrem (0.23 mSv), and the average foot extremity dose equivalent value was approximately 8 mrem (0.08 mrem).

5.2.2 Comparison by Occupation and Sex

Figure 5.13 illustrates that production employees received the highest average hand extremity dose equivalent (85 mrem (0.85 mSv)) and foot extremity dose equivalent (32 mrem (0.32 mSv)).

Employees in the service occupation category received the lowest average hand extremity dose equivalent (3 mrem (0.03 mSv)) and foot extremity dose equivalent (2 mrem (0.02 mSv)).

Figures 5.14 and 5.15 illustrate the similar trends for the male and female employees, respectively.

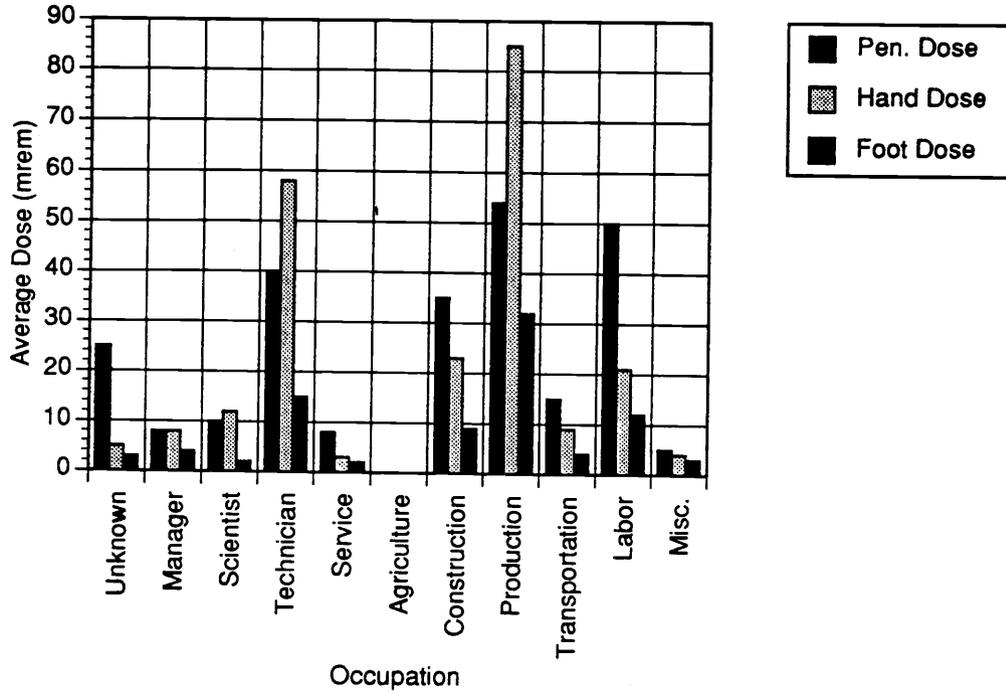


FIGURE 5.13. Comparison of Average Penetrating Dose Equivalent, Average Hand and Arm Extremity Dose Equivalent, and Average Foot and Leg Extremity Dose Equivalent by Occupation for All Employees and Visitors, 1990

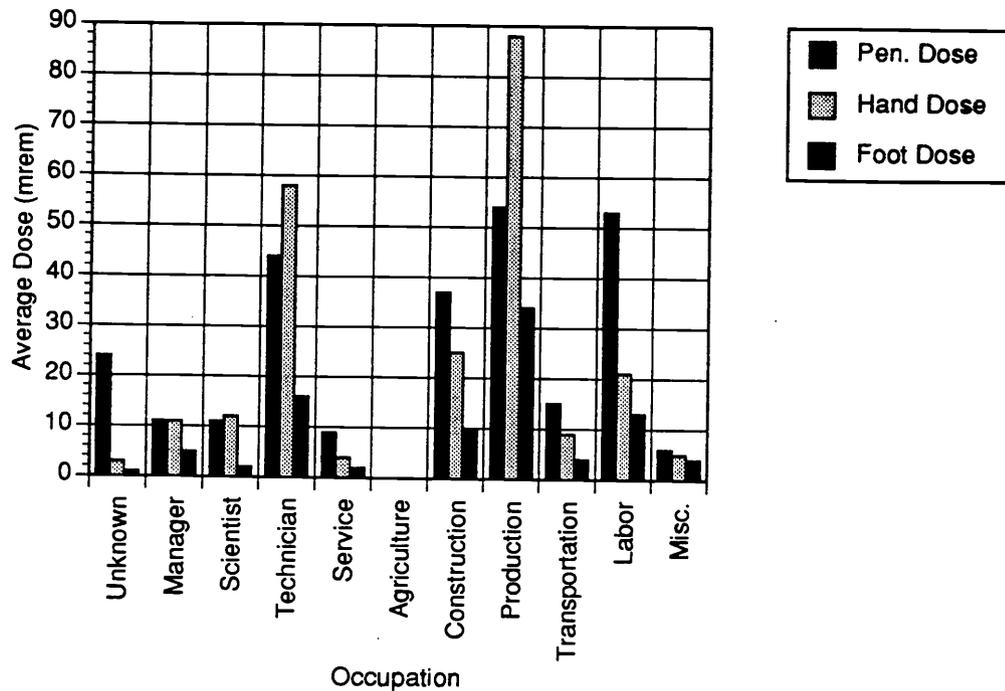


FIGURE 5.14. Comparison of Average Penetrating Dose Equivalent, Average Hand and Arm Extremity Dose Equivalent, and Average Foot and Leg Extremity Dose Equivalent by Occupation for Male Employees and Visitors, 1990

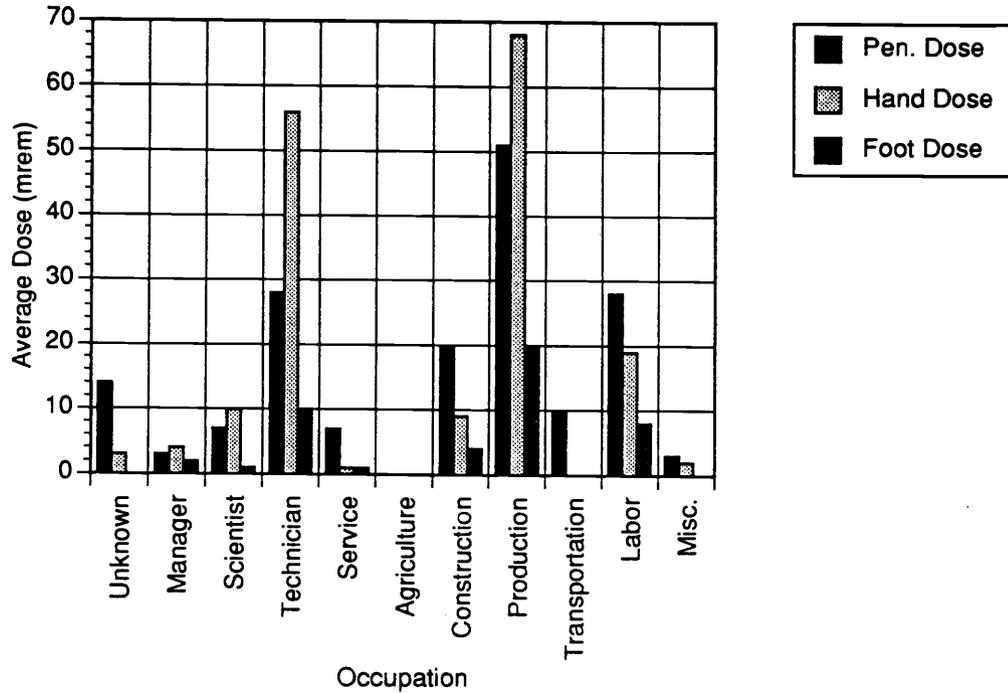


FIGURE 5.15. Comparison of Average Penetrating Dose Equivalent, Average Hand and Arm Extremity Dose Equivalent, and Average Foot and Leg Extremity Dose Equivalent by Occupation for Female Employees and Visitors, 1990

5.2.3 Comparison by Facility Type and Sex

As shown in Figure 5.16, individuals employed in waste processing facilities received the highest average hand extremity dose equivalent (41 mrem (0.41 mSv)) and foot extremity dose equivalent (21 mrem (0.21 mSv)). Employees at fusion research facilities received the lowest average hand extremity dose equivalent (1 mrem (0.01 mSv)) and foot extremity dose equivalent (< 1 mrem (< 0.01 mSv)). Again, similar trends were seen for the male and female components of the population (Figures 5.17 and 5.18).

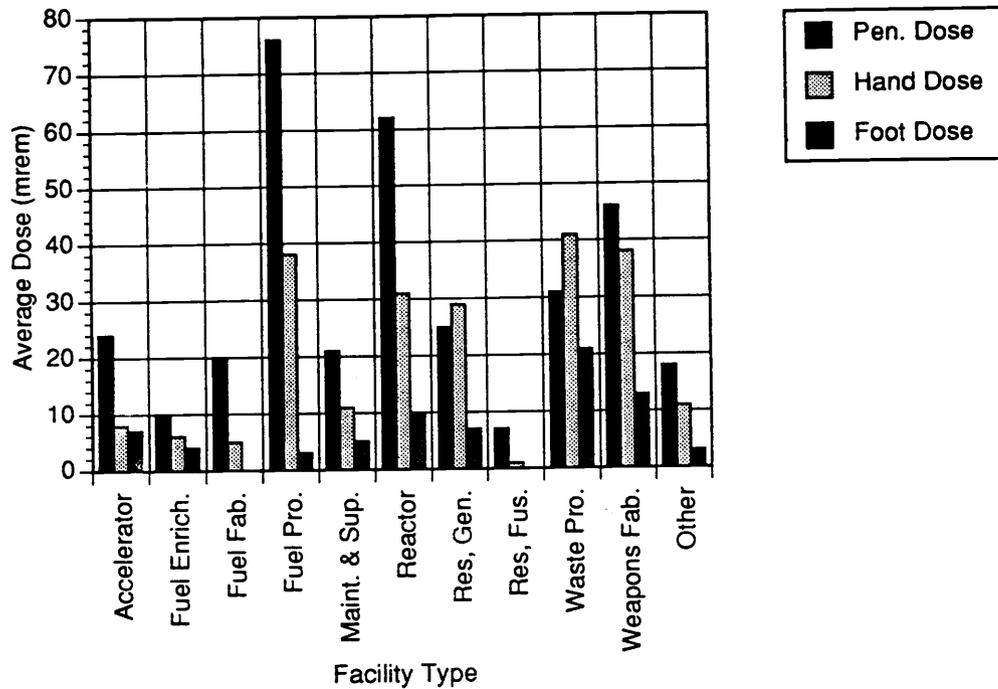


FIGURE 5.16. Comparison of Average Penetrating Dose Equivalent, Average Hand and Arm Extremity Dose Equivalent, and Average Foot and Leg Extremity Dose Equivalent by Facility Type for All Employees and Visitors, 1990

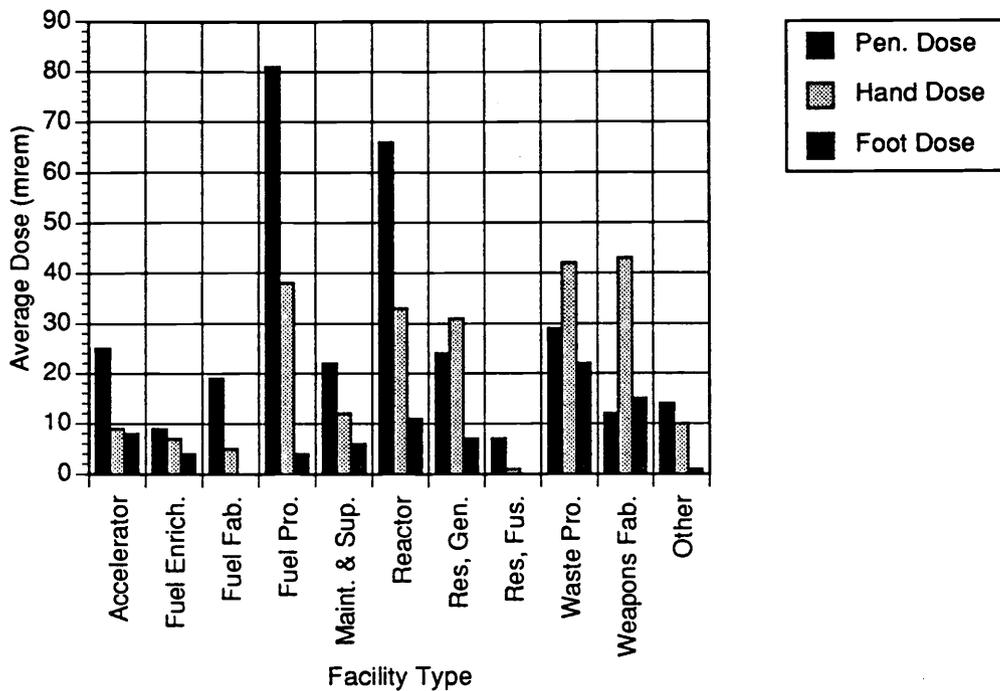


FIGURE 5.17. Comparison of Average Penetrating Dose Equivalent, Average Hand and Arm Extremity Dose Equivalent, and Average Foot and Leg Extremity Dose Equivalent by Facility Type for Male Employees and Visitors, 1990

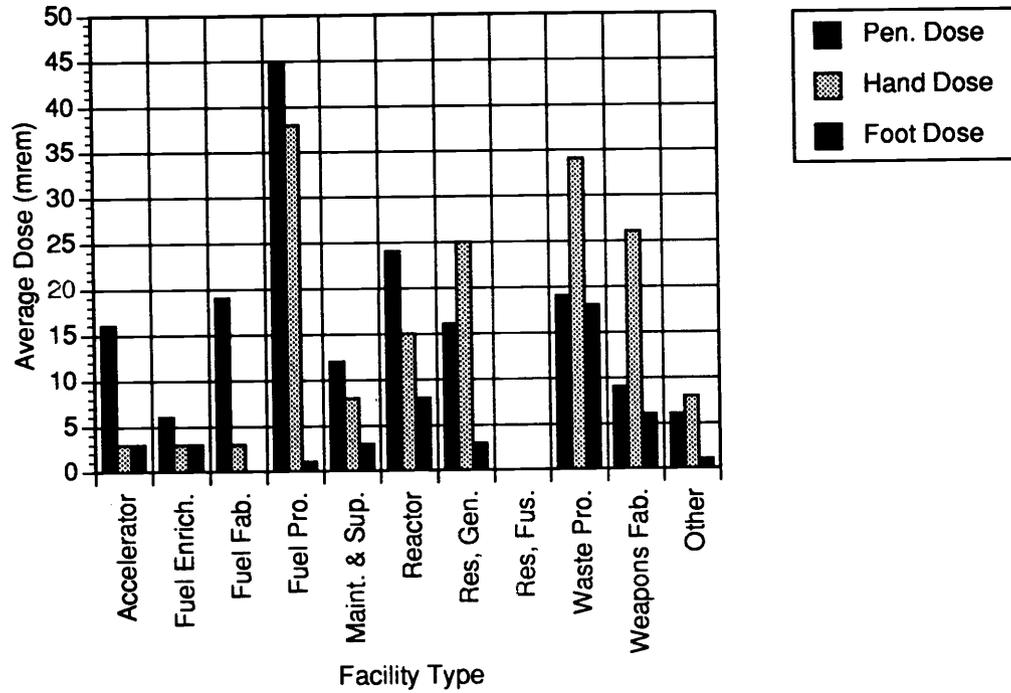


FIGURE 5.18. Comparison of Average Penetrating Dose Equivalent, Average Hand and Arm Extremity Dose Equivalent, and Average Foot and Leg Extremity Dose Equivalent by Facility Type for Female Employees and Visitors, 1990

6.0 REPORTABLE RADIATION EXPOSURE INCIDENTS

In DOE Order 5484.1, the DOE has established criteria for classifying, reporting, and investigating radiation exposure incidents. Depending on the individual doses received, incidents involving exposure to radiation are classified as either Type A, Type B, or Type C occurrences. A Type A occurrence must be reported to DOE Headquarters immediately, and an investigation of the incident is conducted by a DOE Headquarters or field organization board. A Type B occurrence must be reported to DOE Headquarters within 72 hours, and an investigation of the incident is conducted by a DOE board appointed by the head of the field organization. A Type C incident is required to be reported by memo, and an investigation is conducted by DOE contractor personnel when their operations are involved, or by DOE personnel when Federal operations are involved.

Table 6.1 lists the criteria for classifying incidents involving radiation exposures at DOE facilities. Descriptions of such incidents are normally reported to the System Safety Development Center following submittal of the investigation report. No such incidents were reported to have occurred in calendar year 1990.

TABLE 6.1. Dose Criteria for Classification of Incidents Involving Occupational Radiation Exposures

Type of Exposure	Dose Criteria for Incident Type		
	A ^(a)	B ^(b)	C ^(b)
Whole-body	25 rem	5 rem	3 rem
Skin of the whole-body	75 rem	15 rem	5 rem
Thyroid	N/A	15 rem	5 rem
Forearms	150 rem	30 rem	10 rem
Hands and feet	375 rem	75 rem	25 rem
Internal dose	5 times annual standard	In excess of annual standard	N/A

(a) Rem values pertain to a single exposure except for the value for the whole-body, which pertains to a single or annual cumulated exposure.

(b) Rem values pertain to doses accumulated in one quarter.

7.0 COMPARISON OF DOSES TO RISKS

Crucial to assessing the safety of DOE operations with respect to occupational radiation exposure is an assessment of the risks from doses received by DOE and DOE contractor employees. Section 4.0 of this report presented summaries of the radiation doses received by DOE and DOE contractor employees. Although the average doses were much lower than the DOE limits (indicating the impact of ALARA programs and changing missions at many DOE sites), comparison of employee doses to risks is appropriate for evaluating the magnitude of health effects, if any, that may be expected to occur. This section compares the doses received by DOE and DOE contractor employees in 1990 to risks based on published radiation risk coefficients and compares the calculated risks to other risks incurred both inside and outside the workplace.

Important considerations in assessing the relative significance of the risk of radiation doses received at DOE facilities are the doses received from sources other than working at the facilities. Everyone receives radiation doses regularly from various sources, including terrestrial radiation from naturally radioactive elements in the soil, cosmic radiation from space, radon in the air, and naturally radioactive potassium in our bodies. Other sources of radiation to which many of us are exposed include radiation from medical and dental procedures, cigarette smoke, fallout from past nuclear testing, and various food and other consumer products. Typical radiation doses received from each of these sources are listed in Table 7.1. By comparison to the values in Table 7.1, the average dose equivalent received by a DOE and DOE contractor employee who received a measurable occupational exposure during 1990 (86 mrem (0.86 mSv)) was less than the average dose equivalent received by an individual from non-work-related sources.

Although low doses of radiation have not been demonstrated to increase the incidence of cancer or other diseases, risk estimates have been estimated by extrapolating from known effects at high doses and high dose rates to hypothetical effects at low doses. Based primarily on data from survivors of the atomic bombings at Hiroshima and Nagasaki, risk estimates have been developed that express the risk of death from cancer per unit whole-body dose equivalent of ionizing radiation. According to several sources, data published in 1980 suggest that a population distributed over all ages and both sexes would experience approximately 1×10^{-4} cancer deaths per person per rem (NCRP 1987a, ICRP

TABLE 7.1. Radiation Doses Received by Individuals in the U.S. from Sources Other than Occupational Exposures (adapted from NCRP Publication 93 (NCRP 1987b))

Source	Average Annual Effective Dose Equivalent per Member of the U.S. Population (mrem)
Natural sources	
Radon	200
Cosmic	27
Terrestrial	28
In vivo	29
Nuclear Fuel Cycle	0.005
Consumer Products	
Domestic water supply	1 - 6
Building materials	3.6
Other	1 - 10
Medical	53
Total (a)	~360

(a) Value pertains to a nonsmoker. An additional 1300 mrem per year is estimated to be received by a typical smoker from inhalation of tobacco smoke.

1977, NAS 1980, UNSCEAR 1977). However, as detailed in the BEIR III report (NAS 1980), risk coefficients vary considerably depending on the age and sex of the exposed individual. Furthermore, the calculated risk to an individual exposed to low levels of ionizing radiation depends highly on the models chosen to extrapolate from the data on Hiroshima and Nagasaki, where excess deaths were observed only at relatively high doses delivered over a very short period of time.

More recently, both the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) and the Committee on the Biological Effects of Ionizing Radiations (BEIR) provided risk estimates based on a reassessment of the atomic bomb dosimetry as well as extended followups of the survivor data (UNSCEAR 1988, NAS 1990). In general, the associated risk estimates range from approximately 5×10^{-4} per rem to 1×10^{-3} per rem, depending on the age, sex, and risk projection model used; these estimates are based on acute exposures of at least 10 rem (100 mSv). For low doses and dose rates, both UNSCEAR and BEIR recognized the need to reduce these risk estimates by applying a dose rate effectiveness factor (DREF) of at least 2 to these values.

Figure 7.1 shows the estimated incidence of fatal cancers and the total numbers of person-years of life lost based on the whole-body ionizing radiation doses received at DOE facilities in 1990. These hypothetical data are based on age- and sex-specific risk equations provided in the BEIR V report (NAS 1990) and life table calculations as described by Bunger, Cook, and Barrick (1981) and Merwin, Traub, and Faust (1990).

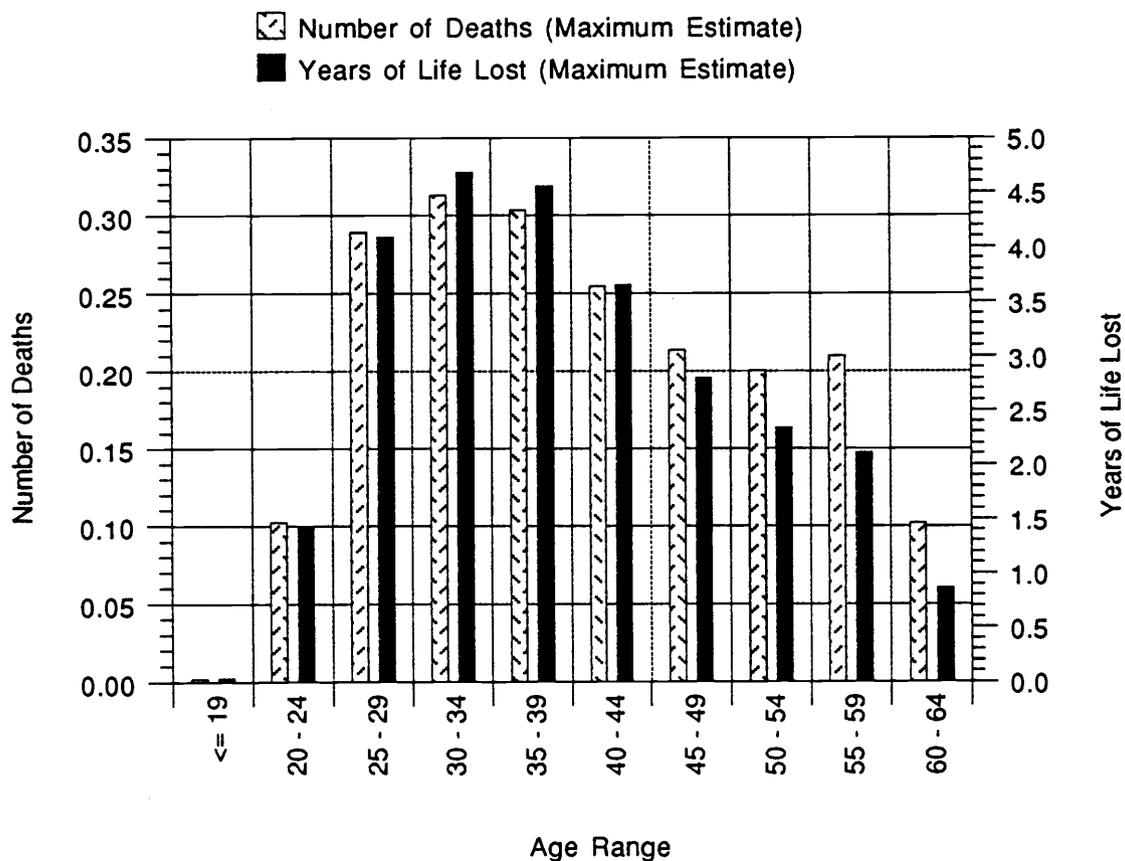


FIGURE 7.1. Estimated Maximum Number of Total Deaths and Years of Life Lost from Radiation Doses Received at DOE Facilities in 1990—(The values indicated are maximum estimates; the actual values may be zero. See text for explanation.)

The values were calculated directly from the BEIR V risk equations and the doses received by employees and visitors at DOE facilities in 1989. Applying a DREF to these values would be appropriate (NAS 1990; UNSCEAR 1988) and would reduce the values by a factor of two or more. Furthermore, the BEIR V risk estimates were based on studies of individuals who received high

doses. Consequently, the actual number of deaths and years of life lost from doses received at DOE facilities may be zero.

To put into perspective the calculated risks from ionizing radiation doses received at DOE facilities, it is important to review the risks associated with other activities. The primary purpose of this review is to indicate the effect of radiation doses received at DOE facilities on the health of workers relative to the effects of other hazards. Table 7.2 lists the estimated annual deaths per 100,000 persons in the U.S. population for various hazards.

As indicated in Table 7.2, reducing radiation doses at DOE facilities is only one way to improve the health of workers. Other effective methods may include anti-smoking campaigns, increased safety awareness, and the promotion of safe driving practices. Radiation doses received at DOE facilities do not significantly reduce the overall health or life expectancy of workers relative to the other risks encountered both in the workplace and as a part of everyday life.

TABLE 7.2. Estimated Annual Fatality Rates in the U.S. Attributable to Various Causes^(a)

<u>Cause</u>	<u>Annual Number of Deaths per 100,000 People or Workers</u>
General Population	
All causes	874
Heart disease	323
Cancer, all types	193
Lung cancer	51
Leukemia	7
Other cancer types	135
Accidents, all types	39
Motor vehicle accidents	19
Other accidents	20
Other causes	319
Occupational	
Industrial injuries and illnesses	4.8 ^(b)
Highway vehicles	1.6
Industrial vehicles or equipment	0.4
Falls	0.4
Heart attacks	0.3
Electrocutions	0.3
Caught between objects other than vehicles or equipment	0.3
Assaults	0.3
Aircraft crashes	0.2
Struck by objects other than vehicles or equipment	0.2
Explosions	0.2
Gas inhalation	0.1
Fires	0.1
Plant machinery operations	0.1
All other (including contact with carcinogenic or toxic substances, drowning, train accidents, and various occupational illnesses)	0.1
Estimated cancer fatalities from radiation doses received at DOE facilities	1.9 ^(c)

(a) Sources: General population data for the year 1985 from National Center for Health Statistics (1988); occupational data (except cancer fatalities from DOE radiation doses) for the years 1986 and 1987 from the Department of Labor (1989).

(b) Ranges from a low of 1.9 per 100,000 in the services industry to a high of 24 per 100,000 in the mining industry.

(c) Based on age- and sex-specific risk equations provided in the BEIR V report (NAS 1990). These equations were based primarily on the Japanese atomic-bomb survivor data, which represented acute exposures. The BEIR V committee recognized the need to apply a dose rate effectiveness factor for chronic exposures, which would reduce the risk estimate provided in the table by a factor of at least two. Value indicates deaths per 100,000 DOE workers.

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APPENDIX A

DISTRIBUTION OF ANNUAL TOTAL EFFECTIVE DOSE EQUIVALENT BY FACILITY TYPE

TABLE A.1
Distribution of Total Effective Dose Equivalent by Facility Type^(a)
Albuquerque Operations
1990

Facility Type	Dose-Equivalent Ranges (rem)											Total Person-rem					
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5	5-6	6-7		7-8	8-9	9-10	>10	Total Persons
Accelerator	775	183	46	31	19	11	1									1,066	46
Maint. and Support	5,816	582	43	19	3											6,463	27
Reactor	64	28	10	4	1	3	3									113	12
Research, General	4,162	457	98	66	65	30	43	6	1	1	1				1	4,930	213
Research, Fusion	139	26	2													167	1
Waste Proc./Management	1,029	51	2	1	1	3	3									1,090	9
Weapons Fab. & Test.	1,996	291	56	21	6											2,370	27
Other	2,568	146	5	7												2,726	6
Visitors	1,735	574	26	10	2											2,347	22
DOE Offices	294	15														309	
Total Persons	18,578	2,353	288	159	97	47	50	6	1	1	1			1	1	21,581	
Total Person-rem		60	44	55	59	41	66	15	4	6	6			11			363

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE A.3
Distribution of Total Effective Dose Equivalent by Facility Type^(a)
DOE Headquarters
1990

Facility Type	Dose-Equivalent Ranges (rem)											Total Person-rem					
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5	5-6	6-7		7-8	8-9	9-10	>10	Total Persons
DOE Offices	543	7														550	0
Total Persons	543	7														550	
Total Person-rem	0																0

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE A.4
Distribution of Total Effective Dose Equivalent by Facility Type^(a)
Idaho Operations
1990

Facility Type	Dose-Equivalent Ranges (rem)											Total Person-rem					
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5	5-6	6-7		7-8	8-9	9-10	>10	Total Persons
Fuel Processing	1,456	322	87	45	46	45	22	5								2,028	146
Maint. and Support	156	109	6	1												272	5
Reactor	649	215	50	18	13	2										947	31
Research, General	613	118	16	14	3											764	12
Waste Proc./Management	124	55	5	1												185	3
Other	1,789	412	52	18	2	3										2,276	31
Visitors	7	295	56	52	30	19	35	10								504	138
Total Persons	4,794	1,526	272	149	94	66	60	15								6,976	
Total Person-rem		45	42	53	58	58	78	33									366

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE A.5
Distribution of Total Effective Dose Equivalent by Facility Type^(a)
Nevada Operations
1990

Facility Type	Dose-Equivalent Ranges (rem)										Total Person-rem						
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5	5-6		6-7	7-8	8-9	9-10	>10	
Maint. and Support	303	4	5	2	1	1										316	4
Weapons Fab. & Test.	712	40	6		1											759	3
Other																2	
Total Persons	1,017	44	11	2	2	1										1,077	
Total Person-rem		2	2	1	1	1											7

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE A.6
Distribution of Total Effective Dose Equivalent by Facility Type^(a)
Oak Ridge Operations
1990

Facility Type	Dose-Equivalent Ranges (rem)											Total Person-rem						
	< Meas.	Meas. - 0.10	0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1-2	2-3	3-4	4-5	5-6		6-7	7-8	8-9	9-10	>10	Total Persons
Fuel/Uran. Enrichment	2,809	2,088	76	8													4,981	55
Fuel Fabrication	979	270	63	16		1											1,329	25
Fuel Processing	93																93	
Research, General	1,049	258	75	22	2	2	2										1,410	34
Waste Proc./Management	129	9															138	
Weapons Fab. & Test.	2,193	1,090	76	9	1	2											3,371	43
Visitors	2,226	579	14	6	2												2,827	16
Total Persons	9,478	4,294	304	61	5	2	5										14,149	
Total Person-rem			96	45	21	3	2	7										173

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE A.7
Distribution of Total Effective Dose Equivalent by Facility Type^(a)
Pittsburgh Naval Reactors Office
1990

Facility Type	Dose-Equivalent Ranges (rem)											Total Person-rem				
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5	5-6	6-7		7-8	8-9	9-10	>10
Reactor	520															520
Research, General	558	763	24	20												1,365
Other	13	17	1	2	1											34
Visitors	79	56														135
Total Persons	1,170	836	25	22	1											2,054
Total Person-rem		11	4	8	1											23

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE A.8
Distribution of Total Effective Dose Equivalent by Facility Type^(a)
Richland Operations
1990

Facility Type	Dose-Equivalent Ranges (rem)											Total Persons	Total Person-rem					
	< Meas.	Meas. - <0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5	5-6			6-7	7-8	8-9	9-10	>10
Accelerator	5	3															8	
Fuel Fabrication	11	14	2														27	1
Fuel Processing	7	16	16	15	2	1											57	11
Maint. and Support	2,278	1,038	141	85	23	14	14	1									3,594	122
Reactor	314	259	59	29	21	10	1										693	50
Research, General	647	537	54	35	16	11	7										1,307	61
Waste Proc./Management	1,288	937	148	73	15	7	3	2									2,473	98
Other	358	128	8	6	1	1											502	8
Visitors		17	3	3													23	3
DOE Offices	167	42	1														210	1
Total Persons	5,075	2,991	432	246	78	44	25	3									8,894	
Total Person-rem		77	68	85	47	38	31	7										353

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE A.9
Distribution of Total Effective Dose Equivalent by Facility Type^(a)
Rocky Flats Operations
1990

Facility Type	Dose-Equivalent Ranges (rem)											Total Person-rem					
	Meas. <0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5	5-6	6-7		7-8	8-9	9-10	>10	Total Persons
Weapons Fab. & Test.	2,371	4,171	927	374	115	70	60	19	8	6	1	1	1	1	1	8,125	753
Visitors	200	994	20													1,214	16
Total Persons	2,571	5,165	947	374	115	70	60	19	8	6	1	1	1	1	1	9,339	
Total Person-rem		147	145	129	70	61	84	46	27	27	5	7	8	15	15		769

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE A.10
Distribution of Total Effective Dose Equivalent by Facility Type^(a)
San Francisco Operations
1990

Facility Type	Dose-Equivalent Ranges (rem)											Total Person-rem					
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5	5-6	6-7		7-8	8-9	9-10	>10	Total Persons
Accelerator	540	306	21	3		1										871	16
Fuel/Uran. Enrichment	734	20	4	3												761	3
Maint. and Support	4,124	70	13	6	3	1	5	1								4,223	18
Research, General	1,598	124	16	11	2		1									1,752	12
Research, Fusion	332	5		1												338	1
Waste Proc./Management	92	2														94	
Weapons Fab. & Test.	1,373	49	10	3												1,435	4
Other	747	20				1		1								769	6
Visitors	48	66	8	3												125	5
DOE Offices	99	1														100	
Total Persons	9,687	663	72	30	5	2	7	1	1							10,468	
Total Person-rem	21	12	11	3	2	9	2	5									64

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE A.11
Distribution of Total Effective Dose Equivalent by Facility Type^(a)
Savannah River Operations
1990

Facility Type	Dose-Equivalent Ranges (rem)													Total Person- rem																		
	Meas. < 0.10		0.10-0.25		0.25-0.50		0.50-0.75		0.75-1.00		1-2		2-3		3-4		4-5		5-6		6-7		7-8		8-9		9-10		>10		Total Persons	
	< Meas.	Meas. -	0.10-	0.25-	0.50-	0.75-	1.00	1-2	2-3	3-4	4-5	5-6	6-7		7-8	8-9	9-10	>10	Persons	rem												
Fuel Fabrication	442	243	49	33	11	4	1																								763	36
Fuel Processing	632	597	265	134	28	9	2																								1,667	135
Maint. and Support	4,064	3,929	618	291	81	25	7	3																							9,018	390
Reactor	609	914	84	8																											1,615	41
Research, General	846	416	27	13	1	2																									1,305	20
Waste Proc./Management	483	409	103	38	13	4	2																								1,052	53
Weapons Fab. & Test.	337	124	7	10	2	1																									481	9
Other	3,264	2,094	36	7																											5,399	48
Visitors	2,052	885	15	1	1																										2,954	18
DOE Offices	310	113	1																												424	2
Total Persons	13,019	9,722	1,205	535	137	45	12	3																							24,678	
Total Person-rem																																753

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE A.12
Distribution of Total Effective Dose Equivalent by Facility Type^(a)
Schenectady Naval Reactors Office
1990

Facility Type	Dose-Equivalent Ranges (rem)											Total Person-rem					
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5	5-6	6-7		7-8	8-9	9-10	>10	
Reactor	50	702	48	24	3											827	31
Research, General	499	407	10													916	7
Other	26															26	
Visitors	209	555	134	102	55	21	57									1,133	203
Total Persons	784	1,664	192	126	58	21	57									2,902	
Total Person-rem		28	30	47	35	18	81										240

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

APPENDIX B

DISTRIBUTION OF ANNUAL TOTAL EFFECTIVE DOSE EQUIVALENT BY CONTRACTOR

TABLE B.1
Distribution of Annual Total Effective Dose Equivalent by Contractor(s)
Albuquerque Operations
1990

Contractor	Dose-Equivalent Ranges (rem)										Total Person-rem					
	< Meas.	Meas. - <0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5		5-6	6-7	7-8	8-9	9-10
Albuquerque Office Subs																
Employees	3	2	2	5												
Visitors																
Total	3	2	2	5												
Allied-Signal, Inc. (Bendix Div.)																
Employees	210	14														
Visitors	5															
Total	215	14														
EG&G Mound Applied Technologies																
Employees	1,905	379	8													
Visitors	340	8														
Total	2,245	387	8													
G.E. - Pinellas																
Employees	229	50	2	2												
Visitors																
Total	229	50	2	2												
Inhalation Toxicology Research Inst.																
Employees	273	16	5													
Visitors																
Total	273	16	5													
Jacobs-Weston Team																
Employees	48															
Visitors																
Total	48															

TABLE B.1 (continued)
Distribution of Annual Total Effective Dose Equivalent by Contractor^(a)
Albuquerque Operations
1990

Contractor	Dose-Equivalent Ranges (rem)											Total Person-rem							
	< Meas.	0.10	0.25	0.50	0.75	1.00	1-2	2-3	3-4	4-5	5-6		6-7	7-8	8-9	9-10	>10	Total Persons	
Johnson Controls, Inc.																			
Employees	1,549	142	26	12	2												1,731	14	
Visitors																			
Total	1,549	142	26	12	2												1,731	14	
Los Alamos National Laboratory																			
Employees	5,023	520	149	99	86	43	47	6	1	1						1	5,976	265	
Visitors	20	180	19	10	1												230	12	
Total	5,043	700	168	109	87	43	47	6	1	1							6,206	277	
MK-Ferguson Co. - UMTRA																			
Employees																		53	
Visitors																			
Total																		53	
MK-Ferguson Subs - UMTRA																			
Employees	447																	447	
Visitors																			
Total	447																	447	
Mason & Hanger - Amarillo																			
Employees	2,312	151	51	20	6													2,540	23
Visitors	156	14																170	
Total	2,468	165	51	20	6													2,710	24
Mason & Hanger - Los Alamos																			
Employees	383	21																404	1
Visitors																			
Total	383	21																404	1

TABLE B.1 (continued)
Distribution of Annual Total Effective Dose Equivalent by Contractor^(a)
Albuquerque Operations
1990

Contractor	Dose-Equivalent Ranges (rem)											Total Person- rem				
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5	5-6	6-7		7-8	8-9	9-10	>10
Ross Aviation, Inc.																
Employees	81		8													89
Visitors																
Total	81		8													89
Sandia National Laboratory																
Employees	2,676	416	18	11	1	3	3									3,128
Visitors	1,057	365	7		1											1,430
Total	3,733	781	25	11	2	3	3									4,558
Westinghouse (WIPP)																
Employees	828	30				1										859
Visitors	157	7														164
Total	985	37				1										1,023
Albuquerque Operations																
Total	17,755	2,323	287	159	97	47	50	6	1	1	1	1	1	1	1	20,727

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE B.2
Distribution of Annual Total Effective Dose Equivalent by Contractor(a)
Chicago Operations
1990

Contractor	Dose-Equivalent Ranges (rem)											Total Person-rem					
	< Meas.	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5	5-6	6-7		7-8	8-9	9-10	>10	
Ames Laboratory (Iowa State)																	
Employees	60														90	1	
Visitors																	
Total	60	30													90	1	
Argonne National Laboratory																	
Employees	2,654	338	120	44	12	7	2								3,177	61	
Visitors		56	8												64	3	
Total	2,654	394	128	44	12	7	2								3,241	64	
Battelle Memorial Institute - Columbus																	
Employees	75	21	2	2	3	1	2								106	6	
Visitors		1													1		
Total	75	22	2	2	3	1	2								107	6	
Brookhaven National Laboratory																	
Employees	1,353	468	108	57	10	4	2								2,002	62	
Visitors	410	590	60	14	3	1									1,078	32	
Total	1,763	1,058	168	71	13	5	2								3,080	94	
Chicago Office Subs																	
Employees	49	17	4	2	3	1									76	4	
Visitors																	
Total	49	17	4	2	3	1									76	4	
Fermilab																	
Employees	1,299	366	37	5	1	1									1,709	19	
Visitors	637	436	36	3											1,112	16	
Total	1,936	802	73	8	1	1									2,821	35	

TABLE B.2 (continued)
Distribution of Annual Total Effective Dose Equivalent by Contractor^(a)
Chicago Operations
1990

Contractor	Dose-Equivalent Ranges (rem)											Total Person- rem				
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5	5-6	6-7		7-8	8-9	9-10	>10
Mass. Inst. of Tech.																
Employees	75	36	5	1	1											118
Visitors	10	1														11
Total	85	37	5	1	1											129
National Revewable Energy Lab (RNEL) - CH																
Employees	11	10														21
Visitors																
Total	11	10														21
Princeton Plasma Physics Laboratory																
Employees	394	158	10													562
Visitors	26	16														42
Total	420	174	10													604
Chicago Operations																
Total	7,053	2,544	390	127	33	16	6									10,169
																214

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE B.3
Distribution of Annual Total Effective Dose Equivalent by Contractor^(a)
Idaho Operations
1990

Contractor	Dose-Equivalent Ranges (rem)											Total Person-rem						
	< Meas.	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5	5-6		6-7	7-8	8-9	9-10	>10	Total Persons
Babcock & Wilcox Idaho, Inc.																		
Employees	371	87	14	1													473	5
Visitors		1															1	
Total	371	88	14	1													474	5
Chem-Nuclear Geotech																		
Employees	358	50	1	1													410	2
Visitors	4	88															92	1
Total	362	138	1	1													502	3
EG&G Idaho, Inc.																		
Employees	1,514	463	77	34	15	2											2,105	50
Visitors		66	5	1													72	3
Total	1,514	529	82	35	15	2											2,177	52
Idaho Office Subs																		
Employees	4																4	
Visitors	1	3															4	
Total	5	3															8	
MK-Ferguson Company - ID																		
Employees	136	40	10	5	9	6	4	1									211	24
Visitors	1	67	35	28	13	10	19	5									178	70
Total	137	107	45	33	22	16	23	6									389	94
MK-Ferguson Subcontractors - ID																		
Employees	11	1			1	1	1	4									19	12
Visitors	1	37	16	20	13	8	16	5									116	58
Total	12	38	16	20	14	9	17	9									135	71

TABLE B.3 (continued)
Distribution of Annual Total Effective Dose Equivalent by Contractor^(a)
Idaho Operations
1990

Contractor	Dose-Equivalent Ranges (rem)										Total Person-rem						
	< Meas.	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5	5-6		6-7	7-8	8-9	9-10	>10	Total Persons
Protection Technology - INEL																	
Employees	334															442	2
Visitors																	
Total	334	108														442	2
West Valley Nuclear Services, Inc.																	
Employees	721	168	37	15		2										943	19
Visitors																	
Total	721	168	37	15		2										943	19
Westinghouse Idaho Nuclear Co.																	
Employees	1,181	269	77	41	39	38	18									1,663	114
Visitors		26		3	4	1										34	5
Total	1,181	295	77	44	43	39	18									1,697	119
Idaho Operations																	
Total	4,637	1,474	272	149	94	66	60	15								6,767	365

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE B.4
Distribution of Annual Total Effective Dose Equivalent by Contractor(a)
Nevada Operations
1990

Contractor	Dose-Equivalent Ranges (rem)											Total Person- rem					
	Meas.-																
	< Meas.	0.10	0.25	0.50	0.75	1.00	1-2	2-3	3-4	4-5	5-6		6-7	7-8	8-9	9-10	>10
EG&G Kirtland																	
Employees	1																1
Visitors																	
Total	1																1
EG&G Las Vegas																	
Employees	115	5															120
Visitors																	
Total	115	5															120
EG&G Santa Barbara																	
Employees	57	4															61
Visitors																	
Total	57	4															61
EG&G Special Technologies Laboratories																	
Employees	5																5
Visitors																	
Total	5																5
EG&G Washington D.C.																	
Employees	5																5
Visitors																	
Total	5																5
Fenix & Scisson, Inc.																	
Employees	77	7	3	2	1	1											91
Visitors																	
Total	77	7	3	2	1	1											91

TABLE B.4 (continued)
Distribution of Annual Total Effective Dose Equivalent by Contractor(a)
Nevada Operations
1990

Contractor	Dose-Equivalent Ranges (rem)										Total Person-rem						
	< Meas.	Meas. <0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5		5-6	6-7	7-8	8-9	9-10	>10
Holmes & Narver, Inc., ESD																	
Employees		29	2	2													33
Visitors																	
Total		29	2	2													33
Nevada Miscellaneous Contractors																	
Employees		70	1														71
Visitors																	
Total		70	1														71
Raytheon Services - Nevada																	
Employees		2															2
Visitors																	
Total		2															2
Raytheon Services Subcontractors																	
Employees		1															1
Visitors																	
Total		1															1
Reynolds Elec. & Engr. Co.																	
Employees		562	25	6	1												594
Visitors																	
Total		562	25	6	1												594
Science Applications Intern'l Corp. -NV																	
Employees		24															24
Visitors																	
Total		24															24
Nevada Operations																	
Total		948	44	11	2	2	1										1,008

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE B-5
Distribution of Annual Total Effective Dose Equivalent by Contractor(a)
Oak Ridge Operations
1990

Contractor	Dose-Equivalent Ranges (rem)											Total Person-rem			
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5	5-6	6-7		7-8	8-9	9-10
Bechtel National, Inc. - (FUSRAP)															
Employees				8											41
Visitors	107	13													120
Total	140	21													161
M.M. Portsmouth Subcontractors															
Employees			3												5
Visitors	276	227													506
Total	276	227	3												506
Martin Marietta (K-25)															
Employees	754	67	1												822
Visitors	50	10													60
Total	804	77	1												882
Martin Marietta (ORNL)															
Employees	936	227	74	22	2	2	2								1,265
Visitors	245	51	5												301
Total	1,181	278	798	22	2	2	2								1,566
Martin Marietta (Paducah)															
Employees	1,005	492	31	2											1,530
Visitors	6	31													37
Total	1,011	523	31	2											1,567
Martin Marietta (Portsmouth)															
Employees	1,050	1,529	45	5											2,629
Visitors		2													2
Total	1,050	1,531	45	5											2,631
Martin Marietta (Y-12)															
Employees	2,193	1,090	76	9	1	2									3,371
Visitors	310	115	2	2											429
Total	2,503	1,205	78	11	1	2									3,800

TABLE B.5 (continued)
Distribution of Annual Total Effective Dose Equivalent by Contractor^(a)
Oak Ridge Operations
1990

Contractor	Dose-Equivalent Ranges (rem)											Total Person-rem					
	< Meas.	<0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5	5-6		6-7	7-8	8-9	9-10	>10
Morrison-Knudsen (WSSRAP)																	
Employees	96		1														97
Visitors	94		3														97
Total	190		4														194
Oak Ridge Inst. for Sci. & Educ. (ORISE)																	
Employees	113		31	1													145
Visitors	1		7														8
Total	114		38	1													153
RMI Company																	
Employees	93																93
Visitors	7																7
Total	100																100
Westinghouse Environ. Mgmt. Co. of Ohio																	
Employees	979	270	63	16						1							1,329
Visitors	1,130	120	4	4	2												1,260
Total	2,109	390	67	20	2					1							2,589
Oak Ridge Operations																	
Total	9,478	4,294	304	61	5	2	5										14,149

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE B.6
Distribution of Annual Total Effective Dose Equivalent by Contractor(a)
Pittsburgh Naval Reactors Office
1990

Contractor	Dose-Equivalent Ranges (rem)											Total Person-rem				
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5	5-6	6-7		7-8	8-9	9-10	>10
Westinghouse Electric (BAPL)																
Employees	187	738	22	20												967
Visitors	71	56														127
Total	258	794	22	20												1,094
Westinghouse Electric (NRF)																
Employees	876															876
Visitors	8															8
Total	884															884
Westinghouse Plant Apparatus Division																
Employees	13	17	1	2	1											34
Visitors																2
Total	13	17	1	2	1											34
Pittsburgh N.R. Office																
Total	1,155	811	23	22	1											2,012

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE B.7
Distribution of Annual Total Effective Dose Equivalent by Contractor^(a)
Richland Operations
1990

Contractor	Dose-Equivalent Ranges (rem)											Total Person-rem			
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5	5-6	6-7		7-8	8-9	9-10
Battelle Memorial Institute (PNI)															
Employees	690	546	57	39	17	12	7								
Visitors	2	1													
Total	690	548	58	39	17	12	7								
Hanford Environmental Health Foundation															
Employees	37	17													
Visitors															
Total	37	17													
Kaiser Engineers Hanford - Cost Const															
Employees	506	292	50	48	16	11	11								
Visitors	2		1												
Total	506	294	50	49	16	11	11								
Westinghouse Hanford Service Subs															
Employees	107	36													
Visitors	1														
Total	107	37													
Westinghouse Hanford Services															
Employees	3,568	2,041	321	156	45	21	7	3							
Visitors	12	2	2												
Total	3,568	2,053	323	158	45	21	7	3							
Richland Operations															
Total	4,908	2,949	431	246	78	44	25	3							

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE B.8
Distribution of Annual Total Effective Dose Equivalent by Contractor^(a)
Rocky Flats Operations
1990

Contractor	Dose-Equivalent Ranges (rem)										Total Person-rem							
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5	5-6		6-7	7-8	8-9	9-10	>10		
EG&G Rocky Flats Services																		
Employees	157	178	33	28	1	3										400	23	
Visitors																		
Total	157	178	33	28	1	3										400	23	
EG&G Rocky Flats																		
Employees	1,555	3,227	859	340	114	66	59	19	8	6	1	1	1	1	1	6,257	705	
Visitors	200	994	20													1,214	16	
Total	1,755	994	20													1,214	16	
EG&G Rocky Flats Security Forces																		
Employees	123	133	4	1												261	4	
Visitors																		
Total	123	133	4	1												261	4	
EG&G Rocky Flats Subcontractors																		
Employees	131	62	4	2												199	2	
Visitors																		
Total	131	62	4	2												199	2	
J. A. Jones - Rocky Flats																		
Employees	165	326	22	2	1	1										517	16	
Visitors																		
Total	165	326	22	2	1	1										517	16	

TABLE B.8 (continued)
Distribution of Annual Total Effective Dose Equivalent by Contractor(a)
Rocky Flats Operations
1990

Contractor	Dose-Equivalent Ranges (rem)											Total Person-rem					
	< Meas.	<0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5	5-6		6-7	7-8	8-9	9-10	>10
Precision Forge																	
Employees	9		3	2													14
Visitors																	
Total	9		3	2													14
Mackenhut Services - Rocky Flats																	
Employees	149		164	1	1												315
Visitors																	
Total	149		164	1	1												315
Rocky Flats Operations																	
Total	2,489	5,087	945	374	115	70	60	19	8	6	1	1	1	1	1	1	9,177
																	768

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE B.9
Distribution of Annual Total Effective Dose Equivalent by Contractor^(a)
San Francisco Operations
1990

Contractor	Dose-Equivalent Ranges (rem)											Total Person-rem			
	< Meas.	Meas. - 0.10-0.25-0.50-0.75-	0.10-0.25-0.50-0.75-	0.50-0.75-1.00	1-2	2-3	3-4	4-5	5-6	6-7	7-8		8-9	9-10	>10
Energy Technology Engineering Center															
Employees	4	4													8
Visitors															
Total	4	4													8
LLNL Plant Services															
Employees	417	14													431
Visitors															1
Total	417	14													431
LLNL Security															
Employees	322	5													327
Visitors															
Total	322	5													327
LLNL Subcontractors															
Employees	15	48	7	3											73
Visitors	15	48	7	3											73
Total															4
Lawrence Berkeley Laboratory															
Employees		302	19	3	1										325
Visitors		17	1												18
Total		319	20	3	1										343
Lawrence Livermore Nat'l Lab. - Nevada															
Employees	78	6	3	1											88
Visitors	3														3
Total	81	6	3	1											91
Lawrence Livermore National Laboratory															
Employees	8,250	186	34	23	5	2	5	1	1						8,507
Visitors															
Total	8,250	186	34	23	5	2	5	1	1						8,507

TABLE B.9 (continued)
Distribution of Annual Total Effective Dose Equivalent by Contractor^(a)
San Francisco Operations
1990

Contractor	Dose-Equivalent Ranges (rem)											Total Person-rem							
	< Meas.	Meas. - 0.10	0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1-2	2-3	3-4	4-5	5-6		6-7	7-8	8-9	9-10	>10	Total Persons	
Rockwell International, Atomics Int'l																			
Employees	1	2	1			1											5	2	
Visitors							1												2
Total	1	2	1			1												5	2
Stanford Linear Accelerator Center																			
Employees	419	70	7															496	4
Visitors																			
Total	419	70	7															496	4
U. of Cal./Davis, Radiobiology Lab -LEHR																			
Employees																		15	
Visitors																		31	
Total																		46	
U. of Cal./SF - Lab of Radiobiology																			
Employees																		41	
Visitors																			
Total																		41	
San Francisco Operations																			
Total	9,588	662	72	30	5	2	7	1	1									10,368	64

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE B.10
Distribution of Annual Total Effective Dose Equivalent by Contractor(a)
Savannah River Operations
1990

Contractor	Dose-Equivalent Ranges (rem)											Total Person-rem					
	< Meas.	Meas. - <0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5	5-6		6-7	7-8	8-9	9-10	>10
American Telephone & Telegraph																	
Employees		11	18														29
Visitors																	
Total		11	18														29
Bechtel Construction - SR																	
Employees		2,568	3,194	444	199	68	23	6									6,502
Visitors																	
Total		2,568	3,194	444	199	68	23	6									6,502
Diversco																	
Employees		214	113	5	1												333
Visitors																	
Total		214	113	5	1												333
Industrial Phases - SR																	
Employees		27	7														34
Visitors																	
Total		27	7														34
Miscellaneous DOE Contractors - SR																	
Employees		102	94	3													199
Visitors																	
Total		102	94	3													199
Southern Bell Tel. & Tel.																	
Employees		8	16														24
Visitors																	
Total		8	16														24
Univ. of Georgia Ecology Laboratory																	
Employees		70	24														94
Visitors																	
Total		70	24														94

TABLE B.10 (continued)
Distribution of Annual Total Effective Dose Equivalent by Contractor^(a)
Savannah River Operations
1990

Contractor	Dose-Equivalent Ranges (rem)											Total Person-rem							
	< Meas.	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5	5-6		6-7	7-8	8-9	9-10	>10	Total Persons	
Wackenhut Services, Inc. - SR																			
Employees			609	453	4	1											1,067	11	
Visitors																			
Total			609	453	4	1											1,067	11	
Westinghouse S.R. Subcontractors																			
Employees			835	541	15	3											1,394	14	
Visitors			2,051	844	15	1											2,912	18	
Total			2,886	1,385	30	4											4,306	32	
Westinghouse Savannah River Co.																			
Employees			6,213	4,264	718	330	68	22	6	3							11,624	409	
Visitors			1	41													42	1	
Total			6,214	4,305	718	330	68	22	6	3							11,666	410	
Savannah River Operations																			
Total			12,709	9,609	1,204	535	137	45	12	3							24,254	751	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE B.11
Distribution of Annual Total Effective Dose Equivalent by Contractor^(a)
Schenectady Naval Reactors Office
1990

Contractor	Dose-Equivalent Ranges (rem)											Total Person-rem				
	< Meas.	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5	5-6	6-7		7-8	8-9	9-10	>10
GE-KAPL - Kesselring																
Employees	47	546	38	22	3										656	25
Visitors	61	137	5												203	3
Total	108	683	43	22	3										859	27
GE-KAPL - Kesselring - Electric Boat																
Employees	64	355	128	102	55	21	57								782	200
Visitors	64	355	128	102	55	21	57								782	200
Total																
GE-KAPL - Knolls																
Employees	489	400	10												899	7
Visitors	22	22													44	
Total	511	422	10												943	7
GE-KAPL - Knolls Subs																
Employees	26														26	
Visitors	8														8	
Total	34														34	
GE-KAPL - Windsor																
Employees	3	151	10	2											166	6
Visitors	54	41	1												96	
Total	57	192	11	2											262	6
Schenectady N.R. Office																
Total	774	1,652	192	126	58	21	57								2,880	240

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

APPENDIX C

DISTRIBUTION OF ANNUAL TOTAL EFFECTIVE DOSE EQUIVALENT FOR DOE EMPLOYEES AND VISITORS BY DOE ORGANIZATION

TABLE C.1
Distribution of Annual Total Effective Dose Equivalent for DOE Employees and Visitors by DOE Organization^(a)
1990

Organization	Dose-Equivalent Ranges (rem)										Total Person-rem								
	Meas. < 0.10		0.10-0.25		0.25-0.50		0.50-0.75		0.75-1.00			Total Persons							
	< 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5	5-6			6-7	7-8	8-9	9-10	>10		
Albuquerque Field Office																			
Employees	661	29	1															691	1
Visitors																			
Total	661	29	1															691	1
Dayton Area Office																			
Employees	37																		37
Visitors																			
Total	37																		37
Kansas City Area Office																			
Employees	13																		13
Visitors																			
Total	13																		13
Los Alamos Area Office																			
Employees	55																		55
Visitors																			
Total	55																		55
Pinellas Area Office																			
Employees	1																		1
Visitors																			
Total	1																		1
UMTRA Project Office																			
Employees	10																		10
Visitors																			
Total	10																		10

TABLE C.1 (continued)
Distribution of Annual Total Effective Dose Equivalent for DOE Employees and Visitors by DOE Organization (a)
1990

Organization	Dose-Equivalent Ranges (rem)										Total Person-rem					
	< Meas.	0.10- <0.10	0.25- 0.25	0.50- 0.50	0.75- 1.00	1-2	2-3	3-4	4-5	5-6		6-7	7-8	8-9	9-10	>10
WIPP Project Office																
Employees		46	1													47
Visitors																
Total		46	1													47
Albuquerque Operations																
Total		823	30	1												854
Chicago Field Office																
Employees		78	3													81
Visitors																
Total		78	3													81
Environmental Meas. Lab.																
Employees		37	3													40
Visitors																
Total		37	3													40
New Brunswick Laboratory																
Employees		52	3													55
Visitors		9														9
Total		61	3													64
Chicago Operations																
Total		176	9													185

TABLE C.1 (continued)
Distribution of Annual Total Effective Dose Equivalent for DOE Employees and Visitors by DOE Organization(a)
1990

Organization	Dose-Equivalent Ranges (rem)										Total Person-rem					
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5	5-6		6-7	7-8	8-9	9-10	>10
DOE Headquarters																
Employees	543		7													550
Visitors																
Total	543		7													550
DOE Headquarters																
Total	543		7													550
Idaho Operations Office																
Employees	157		45													202
Visitors			7													7
Total	157		52													209
Idaho Operations																
Total	157		52													209
Nevada Field Office																
Employees			27													27
Visitors																
Total			27													27
Defense Nuclear Agency - Kirtland AFB																
Employees			11													11
Visitors																
Total			11													11
Environmental Protection Agency (NERC)																
Employees			31													31
Visitors																
Total			31													31
Nevada Operations																
Total			69													69

TABLE C.1 (continued)
Distribution of Annual Total Effective Dose Equivalent for DOE Employees and Visitors by DOE Organization(a)
1990

Organization	Dose-Equivalent Ranges (rem)										Total Person-rem						
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1-2	2-3	3-4	4-5	5-6		6-7	7-8	8-9	9-10	>10	Total Persons
Pittsburgh N.R. Office																	
Employees	15	25	2													42	1
Visitors																	
Total	15	25	2													42	1
Pittsburgh N.R. Office																	
Total	15	25	2													42	1
Richland Operations Office																	
Employees	167	42	1													210	1
Visitors																	
Total	167	42	1													210	1
Richland Operations																	
Total	167	42	1													210	1
Rocky Flats Office																	
Employees	82	78	2													162	1
Visitors																	
Total	82	78	2													162	1
Rocky Flats Operations																	
Total	82	78	2													162	1

TABLE C.1 (continued)
Distribution of Annual Total Effective Dose Equivalent for DOE Employees and Visitors by DOE Organization^(a)
1990

Organization	Dose-Equivalent Ranges (rem)										Total Person-rem						
	< Meas.	<0.10	0.10-0.25	0.25-0.50	0.50-0.75	Meas. -	0.10-0.25	0.25-0.50	0.50-0.75	Total							
						1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	>10	Persons	rem
San Francisco Field Office																	
Employees	99		1														100
Visitors																	
Total	99		1														100
San Francisco Operations																	
Total	99		1														100
S.R. Forest Station																	
Employees	47		12														59
Visitors																	
Total	47		12														59
Savannah River Field Office																	
Employees	263		101	1													365
Visitors																	
Total	263		101	1													365
Sanannah River Operations																	
Total	310		113	1													424
Schenectady N.R. Office																	
Employees	10		12														22
Visitors																	
Total	10		12														22
Schenectady N.R. Office																	
Total	10		12														22

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

APPENDIX D

**EXPOSURE DATA BY DOSE RANGE, EXPOSURE TYPE,
FACILITY TYPE, AGE, SEX, AND OCCUPATION
FOR DOE AND DOE CONTRACTOR EMPLOYEES
AND VISITORS**

TABLE D.1
Distribution of Total Effective Dose Equivalent by Facility Type and Dose Range^(a)
1990 - Male

Facility Type	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem				
	< Meas.	0.10- <0.10	0.25- 0.25	0.50- 0.50	0.75- 0.75	1.00- 1.00	1.5- 1.5	2.0- 2.0	2.5- 2.5	3.0- 3.0	3.5- 3.5			4.0- 4.0	4.5- 4.5	5.0- 5.0	≥ 5
Accelerator	3,464	1,507	211	81	26	15	2									5,306	135
Fuel/Uran. Enrichment	3,034	2,003	71	11												5,119	54
Fuel Fabrication	2,061	583	96	46	12	1	2									2,801	57
Fuel Processing	1,683	786	303	177	71	45	20	2	5	-						3,092	257
Maint. and Support	15,113	5,570	712	363	107	37	26	3	4	1						21,936	522
Reactor	2,266	2,542	428	188	91	35	34	27								5,611	373
Research, General	10,730	3,258	361	192	90	46	40	8	3	3		1		2	14,734	391	
Research, Fusion	846	213	12	1											1,072	8	
Waste Proc./Management	2,818	1,203	231	101	28	14	6	1	1	1					4,404	146	
Weapons Fab. & Test.	7,512	5,086	957	388	122	70	42	20	11	8	5	3	2	4	14,234	784	
Other	8,691	2,789	131	76	11	15	15	6	8					1	11,743	178	
Total Persons	58,218	25,540	3,513	1,624	558	278	187	67	32	13	5	3	3	5	6	90,052	
Total Person-rem	0	655	544	567	338	241	226	111	70	36	16	11	13	24	52	2,904	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.2
Distribution of Total Effective Dose Equivalent by Facility Type and Dose Range^(a)
1990- Female

Facility Type	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem			
	< Meas.	<0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50			3.50-4.00	4.00-4.50	4.50-5.00
Accelerator	481	125	10	2	2	2	1	1							623	10
Fuel/Uran. Enrichment	835	349	12												1,196	8
Fuel Fabrication	520	81	23	9	1	3									637	12
Fuel Processing	512	149	65	17	5	10	2								760	35
Maint. and Support	4,019	1,025	138	47	8	4									5,241	71
Reactor	352	224	29	8	5	1									619	16
Research, General	2,651	455	44	35	14	6	2								3,213	53
Research, Fusion	91	4													95	
Waste Proc./Management	708	291	29	14	2	1	1								1,046	21
Weapons Fab. & Test.	2,048	1,208	144	31	3	1									3,435	68
Other	2,201	649	29	5											2,884	19
Total Persons	14,418	4,560	523	168	40	28	9	3	0	0	0	0	0	0	19,749	
Total Person-rem	0	110	80	58	24	24	12	5	0	0	0	0	0	0	312	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.3
Distribution of Total Effective Dose Equivalent by Facility Type and Dose Range^(a)
1990 - Unknown Sex

Facility Type	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem				
	< Meas.	Meas. - <0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5			3.5-4.0	4.0-4.5	4.5-5.0	≥ 5
Accelerator	11	7														18	
Fuel/Uran. Enrichment	6	26														32	
Maint. and Support	440	143	2													585	2
Research, General	66	110	1													177	2
Weapons Fab. & Test.	260	633	3													896	8
Other	526	799	96	39	27	7	11	6	2							1,513	98
Total Persons	1,309	1,718	102	39	27	7	11	6	2	0	0	0	0	0	0	3,221	
Total Person-rem	0	33	15	14	16	6	13	10	4	0	0	0	0	0	0		111

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.4
Distribution of Collective Total Effective Dose Equivalent by Facility Type and Dose Range^(a)
1990 - Male

Facility Type	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem	Total Persons			
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0			4.0-4.5	4.5-5.0	≥ 5
Accelerator	45	31	29	16	13	2									135	5,306
Fuel/Uran. Enrichment	39	11	4												54	5,119
Fuel Fabrication	15	15	16	8	1	2									57	2,801
Fuel Processing	26	50	61	43	39	22	4	11							257	3,092
Maint. and Support	140	112	127	63	31	31	5	9	3						522	21,936
Reactor	66	66	68	56	31	43	43								373	5,611
Research, General	73	56	67	55	41	48	14	7	8			4		17	391	14,734
Research, Fusion	6	2													8	1,072
Waste Proc./Management	33	36	35	16	12	7	2	2	3						146	4,404
Weapons Fab. & Test.	149	146	134	74	61	52	34	24	22	16	11	8	19	35	784	14,234
Other	62	20	26	7	13	18	10	17					5		178	11,743
Total Person-rem	0	655	544	338	241	226	111	70	36	16	11	13	24	52	2,904	
Total Persons	58,218	25,540	3,513	1,624	558	278	187	67	32	13	5	3	3	5	6	90,052

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.5
Distribution of Collective Total Effective Dose Equivalent by Facility Type and Dose Range^(a)
1990 - Female

Facility Type	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem	Total Persons			
	< Meas.	0.10- <0.10	0.25- 0.25	0.50- 0.50	0.75- 1.00	1.0- 1.5	1.5- 2.0	2.0- 2.5	2.5- 3.0	3.0- 3.5	3.5- 4.0			4.0- 4.5	4.5- 5.0	≥ 5
Accelerator	3	1	1	1	2	2									10	623
Fuel/Uran. Enrichment	7	2													8	1,196
Fuel Fabrication	2	3	3	1	3										12	637
Fuel Processing	4	11	6	3	9	2									35	760
Maint. and Support	25	22	16	4	3										71	5,241
Reactor	5	4	3	3	1										16	619
Research, General	10	7	12	8	5	8	3								53	3,213
Research, Fusion																95
Waste Proc./Management	7	5	5	1	1	1									21	1,046
Weapons Fab. & Test.	34	21	10	2	1										68	3,435
Other	13	4	2												19	2,884
Total Person-rem	0	110	80	58	24	24	5	0	0	0	0	0	0	0	312	
Total Persons	14,418	4,560	523	168	40	28	9	3	0	0	0	0	0	0	19,749	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.6
Distribution of Collective Total Effective Dose Equivalent by Facility Type and Dose Range^(a)
1990 - Unknown Sex

Facility Type	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem	Total Persons			
	< Meas.	0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1.00- 1.5	1.5- 2.0	2.0- 2.5	2.5- 3.0	3.0- 3.5	3.5- 4.0			4.0- 4.5	4.5- 5.0	≥ 5
Accelerator																18
Fuel/Uran. Enrichment																32
Maint. and Support	2															2 585
Research, General	2															2 177
Weapons Fab. & Test.	7	1														8 896
Other	21	14	14	16	6	13	10	4							98	1,513
Total Person-rem	0	33	15	14	16	6	13	10	4	0	0	0	0	0	0	111
Total Persons	1,309	1,718	102	39	27	7	11	6	2	0	0	0	0	0	0	3,221

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.7
Distribution of Total Effective Dose Equivalent by Age and Dose Range^(a)
1990 - Male

Age Range	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem			
	< Meas.	0.10- Meas.- <0.10	0.25- 0.10- 0.25	0.50- 0.25- 0.50	0.75- 0.50- 0.75	1.00- 0.75- 1.00	1.5- 1.0- 1.5	2.0- 1.5- 2.0	2.5- 2.0- 2.5	3.0- 2.5- 3.0	3.5- 3.0- 3.5			4.0- 3.5- 4.0	4.5- 4.0- 4.5	5.0- 4.5- 5.0
19 and less	246	71	4	1											322	2
20 - 24	2,331	1,071	119	47	20	4	2								3,594	78
25 - 29	5,567	2,939	444	220	67	18	10	6	1						9,272	302
30 - 34	8,374	4,277	624	292	91	48	23	4	4						13,737	452
35 - 39	9,191	4,374	639	236	106	51	39	8	1	1					14,652	483
40 - 44	8,930	3,947	503	230	84	39	24	8	3						13,768	392
45 - 49	6,917	2,809	382	190	46	37	19	10	4	1	1	1			10,418	321
50 - 54	5,887	2,222	305	142	53	29	26	12	3	4	1				8,686	293
55 - 59	4,815	1,911	276	165	51	35	29	14	5	3	1	1	1		7,310	323
60 - 64	3,330	1,275	168	81	30	12	10	5	4	2	1	1			4,921	171
65 and greater	1,403	342	39	15	7	4	2		1	2		2	1	2	1,820	68
Unknown	1,227	302	10	5	3	1	3	1							1,552	18
Total Persons	58,218	25,540	3,513	1,624	558	278	187	67	32	13	5	3	3	5	90,052	
Total Person-rem	0	655	544	567	338	241	226	111	70	36	16	11	13	24	2,904	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.8.
Distribution of Total Effective Dose Equivalent by Age and Dose Range^(a)
1990 - Female

Age Range	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem				
	< Meas.	0.10- <0.10	0.25- 0.10-0.25	0.50- 0.25-0.50	0.75- 0.50-0.75	1.00- 0.75-1.00	1.5- 1.0-1.5	2.0- 1.5-2.0	2.5- 2.0-2.5	3.0- 2.5-3.0	3.5- 3.0-3.5			4.0- 3.5-4.0	4.5- 4.0-4.5	5.0- 4.5-5.0	≥ 5
19 and less	156	28	1													185	
20 - 24	1,185	366	32	8	3	4										1,598	20
25 - 29	2,053	740	97	27	7	4	2									2,930	50
30 - 34	2,584	951	117	42	8	8	2									3,712	69
35 - 39	2,511	847	103	28	10	7	1									3,507	61
40 - 44	2,079	636	80	27	4	4	1									2,831	44
45 - 49	1,481	375	43	14	2	1	2									1,918	26
50 - 54	1,013	273	27	12	5		3									1,333	22
55 - 59	666	176	15	4			1									862	10
60 - 64	341	106	8	6	1											462	7
65 and greater	143	27														170	1
Unknown	206	35														241	1
Total Persons	14,418	4,560	523	168	40	28	9	3	0	0	0	0	0	0	0	19,749	
Total Person-rem	0	110	80	58	24	24	12	5	0	0	0	0	0	0	0	312	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.9
Distribution of Total Effective Dose Equivalent by Age and Dose Range^(a)
1990 - Unknown Sex

Age Range	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem				
	Meas. - < 0.10	0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1.0- 1.5	1.5- 2.0	2.0- 2.5	2.5- 3.0	3.0- 3.5	3.5- 4.0			4.0- 4.5	4.5- 5.0	≥ 5	
19 and less																14	
20 - 24																11	
25 - 29																14	
30 - 34																14	
35 - 39																7	
40 - 44																8	
45 - 49																4	
50 - 54																4	
55 - 59																6	
60 - 64																4	
65 and greater																78	
Unknown																2	
	1,195	1,677	95	37	27	7	11	6	2							3,057	108
Total Persons	1,309	1,718	102	39	27	7	11	6	2	0	0	0	0	0	0	3,221	
Total Person-rem	0	33	15	14	16	6	13	10	4	0	0	0	0	0	0	111	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.10
Distribution of Collective Total Effective Dose Equivalent by Age and Dose Range^(a)
1990 - Male

Age Range	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5	4.5-5.0	≥ 5	Total Person-rem
19 and less	2														2
20 - 24	26	19	16	12	3	3									78
25 - 29	75	70	77	41	16	12	11	2							302
30 - 34	112	97	103	56	42	27	7	9							452
35 - 39	114	98	82	64	45	48	13	13	3						483
40 - 44	102	79	81	50	33	28	13	7							392
45 - 49	73	58	67	28	32	23	17	9	3	3	4				321
50 - 54	56	46	49	33	26	31	19	7	11	3					293
55 - 59	49	42	57	31	31	35	24	11	8	3	4	4	9	15	323
60 - 64	32	26	29	18	10	13	9	9	5	3	4			8	171
65 and greater	8	6	5	4	3	2		2	6		8			17	68
Unknown	6	2	2	2	1	4		2							18
Total Person-rem	0	655	544	338	241	226	111	70	36	16	11	13	24	52	2,904
Total Persons	58,218	25,540	3,513	1,624	558	278	187	67	32	13	5	3	5	6	90,052

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.11
Distribution of Collective Total Effective Dose Equivalent by Age and Dose Range^(a)
1990 - Female

Age Range	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem			
	Meas. - <0.10	0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1.0- 1.5	1.5- 2.0	2.0- 2.5	2.5- 3.0	3.0- 3.5	3.5- 4.0		4.0- 4.5	4.5- 5.0	≥ 5
19 and less															185
20 - 24	7	5	3	2	3										20
25 - 29	16	15	9	4	3	3									50
30 - 34	23	17	15	5	7	2									69
35 - 39	22	16	9	6	6		2								61
40 - 44	15	12	9	2	4		2								44
45 - 49	10	6	5	1	1	3									26
50 - 54	7	4	4	3		4									22
55 - 59	5	2	2				2								10
60 - 64	3	1	2	1											7
65 and greater	1														1
Unknown	1														1
Total Person-rem	0	110	80	58	24	24	12	5	0	0	0	0	0	0	312
Total Persons	14,418	4,560	523	168	40	28	9	3	0	0	0	0	0	0	19,749

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.12
Distribution of Collective Total Effective Dose Equivalent by Age and Dose Range^(a)
1990 - Unknown Sex

Age Range	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem	Total Persons				
	< Meas.	Meas.- <0.10	0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1.0- 1.5	1.5- 2.0	2.0- 2.5	2.5- 3.0	3.0- 3.5			3.5- 4.0	4.0- 4.5	4.5- 5.0	≥ 5
19 and less																	14
20 - 24																	11
25 - 29																	14
30 - 34																	14
35 - 39																	7
40 - 44																	8
45 - 49																	4
50 - 54																	4
55 - 59																	6
60 - 64																	4
65 and greater																	2
Unknown																	108
Total Person-rem																	111
Total Persons																	3,221

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.13
Distribution of Total Effective Dose Equivalent by Occupation and Dose Range^(a)
1990 - Male

Occupation	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem			
	< Meas.	0.10- <0.10	0.25- 0.25	0.50- 0.50	0.75- 0.75	1.00- 1.00	1.5- 1.5	2.0- 2.0	2.5- 2.5	3.0- 3.0	3.5- 3.5			4.0- 4.0	4.5- 4.5	5.0- 5.0
Unknown	9,405	2,875	311	155	91	52	48	14	11	4		1		2	12,969	413
Management	5,632	2,186	271	107	31	17	12	1	3	2	2	1		1	8,267	213
Scientists	18,663	6,331	544	229	71	39	26	15	2	3	1	1		1	25,927	471
Technicians	5,633	2,573	630	380	126	64	37	11	7	2	1	1		2	9,469	567
Service	3,918	1,812	70	29	4										5,833	61
Agriculture	90	19													109	
Construction	7,016	4,882	673	299	109	46	37	15	5	1				1	13,084	532
Production	2,909	2,833	835	338	101	46	20	11	4	1	1	1		1	7,101	507
Transportation	1,468	584	47	23	6	2									2,130	36
Laborers	934	584	108	60	19	14	5								1,724	83
Miscellaneous	2,550	861	24	4											3,439	21
Total Persons	58,218	25,540	3,513	1,624	558	278	187	67	32	13	5	3	3	5	90,052	
Total Person-rem	0	655	544	567	338	241	226	111	70	36	16	11	13	24	52	2,904

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.14
Distribution of Total Effective Dose Equivalent by Occupation and Dose Range^(a)
1990 - Female

Occupation	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem				
	< Meas.	Meas. - <0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50			3.50-4.00	4.00-4.50	4.50-5.00	≥ 5
Unknown	2,517	391	28	24	12	7	6	3								2,988	47
Management	4,033	741	39	9	1											4,823	24
Scientists	3,418	941	68	19	3	2										4,451	41
Technicians	1,487	719	143	59	10	6	1									2,425	76
Service	1,132	539	14	3												1,688	14
Agriculture	10	3														13	
Construction	562	342	45	7	3	2	1									962	22
Production	506	570	162	44	8	10	1									1,301	74
Transportation	63	38	1													102	1
Laborers	183	152	21	3	3	1										363	10
Miscellaneous	507	124	2													633	2
Total Persons	14,418	4,560	523	168	40	28	9	3	0	0	0	0	0	0	0	19,749	
Total Person-rem	0	110	80	58	24	24	12	5	0	0	0	0	0	0	0		312

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.15
Distribution of Total Effective Dose Equivalent by Occupation and Dose Range^(a)
1990 - Unknown Sex

Occupation	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem				
	< Meas.	Meas. - <0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5			3.5-4.0	4.0-4.5	4.5-5.0	≥ 5
Unknown	686	1,411	98	39	27	7	11	6	2							2,287	106
Scientists	18	7														25	
Technicians	3	1														4	
Service	14	13														27	
Construction	437	143	2													582	2
Laborers	1	1														2	
Miscellaneous	150	142	2													294	3
Total Persons	1,309	1,718	102	39	27	7	11	6	2	0	0	0	0	0	0	3,221	
Total Person-rem	0	33	15	14	16	6	13	10	4	0	0	0	0	0	0		111

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.16.
Distribution of Collective Total Effective Dose Equivalent by Occupation and Dose Range^(a)
1990 - Male

Occupation	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem			
	< Meas.	0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1.0- 1.5	1.5- 2.0	2.0- 2.5	2.5- 3.0	3.0- 3.5	3.5- 4.0		4.0- 4.5	4.5- 5.0	≥ 5
Unknown	71	48	54	56	46	58	23	24	11	4	4	4	17	413	12,969
Management	52	43	37	19	15	14	2	6	5	6	4	4	5	213	8,267
Scientists	145	82	80	44	34	32	25	4	8	3	4	4	5	471	25,927
Technicians	79	101	133	77	55	45	18	15	6	3	4	4	9	567	9,469
Service	39	10	10	2										61	5,833
Agriculture															109
Construction	129	103	106	65	40	45	25	11	3				5	532	13,084
Production	92	130	117	60	40	23	18	9	3	3	4	4	8	507	7,101
Transportation	14	7	9	3										36	2,130
Laborers	16	17	21	12	12	5								83	1,724
Miscellaneous	17	3	1											21	3,439
Total Person-rem	0	655	544	567	338	241	226	111	70	36	16	11	13	24	2,904
Total Persons	58,218	25,540	3,513	1,624	558	278	187	67	32	13	5	3	3	5	6

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.17
Distribution of Collective Total Effective Dose Equivalent by Occupation and Dose Range^(a)
1990 - Female

Occupation	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem	Total Persons				
	< Meas.	0.10- Meas.- <0.10	0.25- 0.10- 0.25	0.50- 0.25- 0.50	0.75- 0.50- 0.75	1.00- 0.75- 1.00	1.5- 1.0- 1.5	2.0- 1.5- 2.0	2.5- 2.0- 2.5	3.0- 2.5- 3.0	3.5- 3.0- 3.5			4.0- 3.5- 4.0	4.5- 4.0- 4.5	5.0- 4.5- 5.0	≥ 5
Unknown		9	4	8	7	6	8	5								47	2,988
Management		15	5	3	1											24	4,823
Scientists		21	10	6	2	2										41	4,451
Technicians		20	22	-	21	6	5	1								76	2,425
Service		11	2	1												14	1,688
Agriculture																	13
Construction		8	7	2	2	2	1									22	962
Production		18	26	15	5	8	1									74	1,301
Transportation		1														1	102
Laborers		4	3	1	2	1										10	363
Miscellaneous		2														2	633
Total Person-rem	0	110	80	58	24	24	12	5	0	0	0	0	0	0	0	312	
Total Persons	14,418	4,560	523	168	40	28	9	3	0	0	0	0	0	0	0		19,749

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.18
Distribution of Collective Total Effective Dose Equivalent by Occupation and Dose Range^(a)
1990 - Unknown Sex

Occupation	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem	Total Persons			
	< Meas.	0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1.00- 1.5	1.5- 2.0	2.0- 2.5	2.5- 3.0	3.0- 3.5	3.5- 4.0			4.0- 4.5	4.5- 5.0	≥ 5
Unknown	28	14	14	16	6	13	10	4							106	2,287
Scientists																25
Technicians																4
Service																27
Construction	2														2	582
Laborers																2
Miscellaneous	3														3	294
Total Person-rem	0	33	15	14	16	6	13	10	4	0	0	0	0	0	111	
Total Persons	1,309	1,718	102	39	27	7	11	6	2	0	0	0	0	0		3,221

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.19
Distribution of Persons Receiving Total Effective Dose Equivalent by Age and Facility Type^(a)
1990 - Male

Facility Type	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown
Accelerator	30	240	612	811	750	734	610	569	431	233	108	178	5,306	135
Fuel/Uran. Enrichment	14	104	299	568	1,014	1,017	642	471	396	408	99	87	5,119	54
Fuel Fabrication	12	170	385	516	471	371	275	217	208	134	42		2,801	57
Fuel Processing	1	175	411	583	535	514	291	212	190	155	25		3,092	257
Maint. and Support	85	1,011	2,446	3,443	3,617	3,313	2,454	2,091	1,764	1,108	386	218	21,936	522
Reactor	3	204	829	980	996	856	563	472	386	262	39	21	5,611	373
Research, General	98	644	1,193	1,973	2,275	2,042	1,768	1,513	1,390	976	518	344	14,734	391
Research, Fusion	1	28	76	134	152	153	140	126	96	79		37	1,072	8
Waste Proc./Management	11	193	579	803	760	681	471	407	266	157	53	23	4,404	146
Weapons Fab. & Test.	18	285	963	1,994	2,224	2,350	1,937	1,677	1,444	896	235	211	14,234	784
Other	49	540	1,479	1,932	1,858	1,737	1,267	931	739	513	265	433	11,743	178
Total Persons	322	3,594	9,272	13,737	14,652	13,768	10,418	8,686	7,310	4,921	1,820	1,552	90,052	
Total Person-rem	2	78	302	452	483	392	321	293	323	171	68	18	2,904	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.20
Distribution of Persons Receiving Total Effective Dose Equivalent by Age and Facility Type^(a)
1990 - Female

Facility Type	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown
Accelerator	17	57	107	120	100	83	48	39	19	10	6	17	623	10
Fuel/Uran. Enrichment	9	82	134	205	252	167	114	86	78	41	12	16	1,196	8
Fuel Fabrication	2	54	109	131	111	109	40	37	23	18	3		637	12
Fuel Processing	2	80	120	190	135	101	69	38	14	7	4		760	35
Maint. and Support	37	383	803	967	900	795	575	348	235	119	32	47	5,241	71
Reactor	2	66	131	146	104	80	38	20	15	10	2	5	619	16
Research, General	65	274	429	617	578	359	302	226	154	83	46	80	3,213	53
Research, Fusion		5	7	15	13	20	14	5	6	4	3	3	95	
Waste Proc./Management	4	95	202	187	198	145	102	58	26	22	5	2	1,046	21
Weapons Fab. & Test.	18	150	363	606	636	609	390	317	198	104	30	14	3,435	68
Other	29	352	525	528	480	363	226	159	94	44	27	57	2,884	19
Total Persons	185	1,598	2,930	3,712	3,507	2,831	1,918	1,333	862	462	170	241	19,749	
Total Person-rem	0	20	50	69	61	44	26	22	10	7	1	1		312

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.21
Distribution of Persons Receiving Total Effective Dose Equivalent by Age and Facility Type^(a)
1990 - Unknown Sex

Facility Type	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem		
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown	
Accelerator				1	1						1		15	18	
Fuel/Uran. Enrichment						1							31	32	
Maint. and Support		1		1									583	585	2
Research, General	13	8	8	1					1	1			145	177	2
Weapons Fab. & Test.	1	2	2	6	3	2	3	2	2	1			872	896	8
Other			3	5	3	6	1	2	3	1	78	1,411	1,513	98	
Total Persons	14	11	14	14	7	8	4	4	6	4	78	3,057	3,221		
Total Person-rem	0	0	0	0	0	0	0	0	0	0	2	108	111		

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.22
Distribution of Collective Total Effective Dose Equivalent by Age and Facility Type^(a)
1990 - Male

Facility Type	Collective Dose Equivalent in Each Age Range														Total Person-rem
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65	Unknown			
Accelerator	4	14	24	22	23	16	11	14	4	2	2	135	5,306		
Fuel/Uran. Enrichment	1	4	9	11	11	6	4	4	4	1		54	5,119		
Fuel Fabrication	2	9	12	10	6	4	3	6	3			57	2,801		
Fuel Processing	14	47	64	50	36	20	9	10	6			257	3,092		
Maint. and Support	1	30	83	101	74	49	39	35	12	3	1	522	21,936		
Reactor	8	49	63	80	55	46	34	20	16		1	373	5,611		
Research, General	6	29	58	79	42	28	39	44	25	38	2	391	14,734		
Research, Fusion		1	2	1	1	1	1	1	1			8	1,072		
Waste Proc./Management	5	25	33	27	19	10	10	11	4	1		146	4,404		
Weapons Fab. & Test.	2	21	59	70	106	120	130	169	91	15	1	784	14,234		
Other	6	21	27	37	19	20	13	11	6	7	11	178	11,743		
Total Person-rem	2	78	302	452	483	321	293	323	171	68	18	2,904			
Total Persons	322	3,594	9,272	13,737	14,652	10,418	8,686	7,310	4,921	1,820	1,552	90,052			

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.23
Distribution of Collective Total Effective Dose Equivalent by Age and Facility Type^(a)
1990 - Female

Facility Type	Collective Dose Equivalent in Each Age Range											Total Person-rem	Total Persons		
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown	
Accelerator		1	1	1	2	3	1							10	623
Fuel/Uran. Enrichment		1	1	2	2	1	1	1						8	1,196
Fuel Fabrication		1	1	4	1	4								12	637
-Fuel Processing		4	7	13	7	2	1							35	760
Maint. and Support		8	16	18	12	8	3	3	1					71	5,241
Reactor		1	2	4	4	3	1							16	619
Research, General		1	8	10	11	4	5	9	3	2				53	3,213
Research, Fusion															95
Waste Proc./Management		2	4	3	4	2	5							21	1,046
Weapons Fab. & Test.		1	5	10	14	14	9	7	5	3				68	3,435
Other		3	6	4	2	2	1	1						19	2,884
Total Person-rem	0	20	50	69	61	44	26	22	10	7	1	1	1	312	
Total Persons	185	1,598	2,930	3,712	3,507	2,831	1,918	1,333	862	462	170	241	241		19,749

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

**TABLE D.24
Distribution of Collective Total Effective Dose Equivalent by Age and Facility Type^(a)
1990 - Unknown Sex**

Facility Type	Collective Dose Equivalent in Each Age Range											Total Person-rem	Total Persons					
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown				
Accelerator																	18	
Fuel/Uran. Enrichment																	32	
Maint. and Support																2	585	
Research, General																2	177	
Weapons Fab. & Test.																7	896	
Other															2	96	98	1,513
Total Person-rem	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	108	111	
Total Persons	14	11	14	14	7	8	4	4	4	4	6	4	4	78	3,057		3,221	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.25
Distribution of Persons Receiving Total Effective Dose Equivalent by Age and Occupation^(a)
1990 - Male

Occupation	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown
Unknown	121	591	1,084	1,791	1,704	1,782	1,677	1,519	1,133	721	414	432	12,969	413
Management	15	92	356	853	1,367	1,547	1,261	1,122	888	569	150	47	8,267	213
Scientists	18	870	2,740	3,974	4,150	3,918	3,007	2,583	2,309	1,520	618	220	25,927	471
Technicians	20	433	1,176	1,736	1,712	1,391	876	710	685	442	102	186	9,469	567
Service	22	301	1,041	1,224	901	746	473	362	272	190	123	178	5,833	61
Agriculture		8	11	21	16	18	4	10	11	3	2	5	109	
Construction	59	718	1,390	1,904	2,194	2,180	1,529	1,209	932	689	150	130	13,084	532
Production	10	207	745	1,119	1,394	1,134	831	562	552	432	97	18	7,101	507
Transportation	3	44	165	334	403	370	245	211	202	107	23	23	2,130	36
Laborers	16	95	231	326	317	258	155	113	98	58	11	46	1,724	83
Miscellaneous	38	235	333	455	494	424	360	285	228	190	130	267	3,439	21
Total Persons	322	3,594	9,272	13,737	14,652	13,768	10,418	8,686	7,310	4,921	1,820	1,552	90,052	
Total Person-rem	2	78	302	452	483	392	321	293	323	171	68	18	2,904	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.26
Distribution of Persons Receiving Total Effective Dose Equivalent by Age and Occupation^(a)
1990 - Female

Occupation	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem		
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown	
Unknown	69	269	372	455	450	424	340	263	159	-	80	50	57	2,988	47
Management	22	299	541	739	805	837	618	464	310	126	42	42	20	4,823	24
Scientists	5	354	886	1,010	838	526	349	212	143	82	30	30	16	4,451	41
Technicians	20	201	378	547	493	365	165	114	68	47	7	7	20	2,425	76
Service	12	175	240	330	297	207	147	102	64	57	18	18	39	1,688	14
Agriculture		1	2	1	3	4		2						13	
Construction	11	115	203	193	175	114	66	32	26	20	1	1	6	962	22
Production	5	64	153	261	272	220	150	77	59	32	7	7	1	1,301	74
Transportation		2	15	22	21	15	14	5	3	3	2	2		102	1
Laborers	12	20	46	61	65	63	40	38	8	5	5		5	363	10
Miscellaneous	29	98	94	93	88	56	29	24	22	10	13	13	77	633	2
Total Persons	185	1,598	2,930	3,712	3,507	2,831	1,918	1,333	862	462	170	170	241	19,749	
Total Person-rem	0	20	50	69	61	44	26	22	10	7	1	1	1	312	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.27
Distribution of Persons Receiving Total Effective Dose Equivalent by Age and Occupation^(a)
1990 - Unknown Sex

Occupation	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	65			Unknown
Unknown	1	2	6	12	6	8	4	4	5	2	78	2,159	2,287	106
Scientists				2								23	25	
Technicians												4	4	
Service												27	27	
Construction		1			1					1		579	582	2
Laborers												2	2	
Miscellaneous	13	8	6	1	1				1	1		263	294	3
Total Persons	14	11	14	14	7	8	4	4	6	4	78	3,057	3,221	
Total Person-rem	0	0	0	0	0	0	0	0	0	0	2	108		111

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

**TABLE D.28
Distribution of Collective Total Effective Dose Equivalent by Age and Occupation^(a)
1990 - Male**

Occupation	Collective Dose Equivalent in Each Age Range											Total Person-rem		
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65		Unknown	
Unknown	1	5	28	56	79	50	41	43	41	21	38	11	413	12,969
Management		1	9	21	28	28	37	41	29	18	1		213	8,267
Scientists		7	39	59	60	64	52	60	84	32	12	2	471	25,927
Technicians		15	65	102	92	68	53	49	80	38	3	2	567	9,469
Service		2	10	11	9	10	5	5	4	3	1	1	61	5,833
Agriculture													109	
Construction	1	27	58	85	96	85	63	52	44	18	3		532	13,084
Production		17	75	88	90	70	54	35	33	38	8		507	7,101
Transportation		1	2	6	10	5	5	3	4	1			36	2,130
Laborers		3	14	21	15	11	9	6	3	1			83	1,724
Miscellaneous		1	2	4	3	3	2	1	2	1		1	21	3,439
Total Person-rem	2	78	302	452	483	392	321	293	323	171	68	18	2,904	
Total Persons	322	3,594	9,272	13,737	14,652	13,768	10,418	8,686	7,310	4,921	1,820	1,552	90,052	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.29
Distribution of Collective Total Effective Dose Equivalent by Age and Occupation^(a)
1990 - Female

Occupation	Collective Dose Equivalent in Each Age Range											Total Person-rem	Total Persons	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown
Unknown		1	7	6	10	6	4	9	2	2	2		47	2,988
Management		1	2	3	4	4	3	3	2	2	1		24	4,823
Scientists		3	6	10	6	7	3	2	2	2	1		41	4,451
Technicians		6	14	22	14	10	5	2	1	1			76	2,425
Service		2	2	3	2	1	1	1	1				14	1,688
Agriculture														13
Construction		2	7	5	4	2	1						22	962
Production		4	9	18	16	12	8	3	2	2	1		74	1,301
Transportation													1	102
Laborers			1	2	3	2	1	1					10	363
Miscellaneous				1									2	633
Total Person-rem	0	20	50	69	61	44	26	22	10	7	1	1	312	
Total Persons	185	1,598	2,930	3,712	3,507	2,831	1,918	1,333	862	462	170	241	19,749	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.30
Distribution of Collective Total Effective Dose Equivalent by Age and Occupation^(a)
1990 - Unknown Sex

Occupation	Collective Dose Equivalent in Each Age Range											Total Person-rem		
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65		Unknown	
Unknown											2	103	106	2,287
Scientists														25
Technicians														4
Service														27
Construction												2	2	582
Laborers														2
Miscellaneous												3	3	294
Total Person-rem	0	0	0	0	0	0	0	0	0	0	2	108	111	
Total Persons	14	11	14	14	7	8	4	4	6	4	78	3,057		3,221

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.31
Distribution of Persons Receiving Total Effective Dose Equivalent by Occupation and Facility Type^(a)
1990 - Male

Facility Type	Number of Persons Receiving Radiation Doses in Each Occupation											Total Persons rem	
	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer	Misc.		Total Persons
Accelerator	1,164	131	2,021	1,402	122	17	139	100	34	1	175	5,306	135
Fuel/Uran. Enrichment	244	790	1,146	512	343	1	1,019	782	46	177	59	5,119	54
Fuel Fabrication	33	254	835	238	135		904	256	41	85	20	2,801	57
Fuel Processing	8	334	1,340	190	43	1	472	611	42	23	28	3,092	257
Maint. and Support	4,412	1,939	3,045	1,277	1,311	25	7,179	1,147	723	829	49	21,936	522
Reactor	21	753	2,285	545	130		640	712	85	61	379	5,611	373
Research, General	2,959	917	5,651	1,904	549	9	505	346	57	110	1,727	14,734	391
Research, Fusion	115	77	443	216	48		104	32		1	36	1,072	8
Waste Proc./Management	109	563	1,434	655	174		733	482	160	55	39	4,404	146
Weapons Fab. & Test.	2,082	1,690	3,731	1,741	840		1,037	2,367	405	242	99	14,234	784
Other	1,822	819	3,996	789	2,138	56	352	266	537	140	828	11,743	178
Total Persons	12,969	8,267	25,927	9,469	5,833	109	13,084	7,101	2,130	1,724	3,439	90,052	
Total Person-rem	413	213	471	567	61	0	532	507	36	83	21	2,904	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.32
Distribution of Persons Receiving Total Effective Dose Equivalent by Occupation and Facility Type^(a)
1990 - Female

Facility Type	Number of Persons Receiving Radiation Doses in Each Occupation										Total Persons-rem	
	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer		Misc.
Accelerator	169	71	226	101	41	4	4	4	4	7	623	10
Fuel/Uran. Enrichment	71	464	217	169	81	43	97	3	33	18	1,196	8
Fuel Fabrication	8	154	214	88	23	41	85	3	19	2	637	12
Fuel Processing	1	186	240	57	29	45	197	3	1	1	760	35
Maint. and Support	1,107	1,491	705	620	272	640	140	46	205	15	5,241	71
Reactor	3	163	171	63	21	36	131	2	4	25	619	16
Research, General	775	502	862	536	113	2	36	1	17	353	3,213	53
Research, Fusion	12	29	29	15	6	2	2			2	95	
Waste Proc./Management	19	228	208	195	195	35	139	14	4	9	1,046	21
Weapons Fab. & Test.	510	1,020	750	380	147	97	440	10	55	26	3,435	68
Other	313	515	829	201	760	11	32	20	25	175	2,884	19
Total Persons	2,988	4,823	4,451	2,425	1,688	13	962	102	363	633	19,749	
Total Person-rem	47	24	41	76	14	0	22	74	1	10	2	312

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.33
Distribution of Persons Receiving Total Effective Dose Equivalent by Occupation and Facility Type^(a)
1990 - Unknown Sex

Facility Type	* * * * * Number of Persons Receiving Radiation Doses in Each Occupation * * * * *										Total Person-rem	
	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer		Misc.
Accelerator	2		11	3	1		1					18
Fuel/Uran. Enrichment	32											32
Maint. and Support					3		581			1		585
Research, General	6		12		1						158	177
Weapons Fab. & Test.	872				22					1	1	896
Other	1,375		2		1						135	1,513
Total Persons	2,287	0	25	4	27	0	582	0	0	2	294	3,221
Total Person-rem	106	0	0	0	0	0	2	0	0	0	3	111

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.34
Distribution of Collective Total Effective Dose Equivalent by Occupation and Facility Type^(a)
1990 - Male

Facility Type	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer	Misc.	Total Persons	Total Person-rem
Accelerator	57	1	25	42			2	3	4		1	135	5,306
Fuel/Uran. Enrichment	1	6	5	4	7		11	12	1	8		54	5,119
Fuel Fabrication		3	8	8	8		5	22	2	1		57	2,801
Fuel Processing	1	6	40	34	1		64	105	2	4		257	3,092
Maint. and Support	22	16	30	88	11		258	32	10	53		522	21,936
Reactor	1	23	60	76	1		104	90	1	12	5	373	5,611
Research, General	181	10	71	86	6		16	10	2	1	6	391	14,734
Research, Fusion			2	2	1		1	1				8	1,072
Waste Proc./Management	7	9	21	22			26	52	8			146	4,404
Weapons Fab. & Test.	53	135	174	190	10		37	175	5	4	2	784	14,234
Other	91	3	35	15	15		6	7	1		6	178	11,743
Total Person-rem	413	213	471	567	61	0	532	507	36	83	21	2,904	
Total Persons	12,969	8,267	25,927	9,469	5,833	109	13,084	7,101	2,130	1,724	3,439		90,052

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

**TABLE D.35
Distribution of Persons Receiving Total Effective Dose Equivalent by Occupation and Facility Type^(a)
1990 - Female**

Facility Type	* * * * * Number of Persons Receiving Radiation Doses in Each Occupation * * * * *											Total Person- rem	
	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer	Misc.		Total Persons
Accelerator	6		1	2								10	623
Fuel/Uran. Enrichment		1	1	1	1		2			1		8	1,196
Fuel Fabrication		1	1				8					12	637
Fuel Processing			6	5	-		2	22				35	760
Maint. and Support	3	5	4	30	1		15	5	1	7		71	5,241
Reactor			2	5			1	6		1		16	619
Research, General	30	1	5	13	1		1	1			1	53	3,213
Research, Fusion													95
Waste Proc./Management		2	1	5	1		1	10				21	1,046
Weapons Fab. & Test.	7	12	15	10	2		2	18		1		68	3,435
Other	2	1	4	3	8						1	19	2,884
Total Person-rem	47	24	41	76	14	0	22	74	1	10	2	312	
Total Persons	2,988	4,823	4,451	2,425	1,688	13	962	1,301	102	363	633		19,749

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D36
Distribution of Persons Receiving Total Effective Dose Equivalent by Occupation and Facility Type^(a)
1990 - Unknown Sex

Facility Type	* * * * * Number of Persons Receiving Radiation Doses in Each Occupation * * * * *										Total Person-rem	
	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer		Misc.
Accelerator												18
Fuel/Uran. Enrichment												32
Maint. and Support						2						2 585
Research, General										2		2 177
Weapons Fab. & Test.	7										8	896
Other	98									1	98	1,513
Total Person-rem	106	0	0	0	0	2	0	0	0	0	3	111
Total Persons	2,287	0	25	4	27	0	582	0	0	2	294	3,221

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.37
Distribution of Internal Dose by Facility Type and Dose Range^(a)
1990 - Male

Facility Type	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem					
	< Meas.	0.10- <0.10	0.25- 0.25	0.50- 0.50	0.75- 0.75	1.00- 1.00	1.5- 1.5	2.0- 2.0	2.5- 2.5	3.0- 3.0	3.5- 3.5			4.0- 4.0	4.5- 4.5	5.0- 5.0	≥ 5	
Accelerator																8		
Fuel/Uran. Enrichment		476	17	1													494	9
Fuel Fabrication		40	3	1	1	1	1										47	4
Fuel Processing		90	12	5	1	3											111	9
Maint. and Support		1,225	30	12	3		4	1									1,275	43
Reactor		535	8	4													547	13
Research, General		246	48	13	12	6	11	1	1	2	1	1	1	2	2		343	75
Research, Fusion		15	2														17	
Waste Proc./Management		118	13	5	2	3	3	1	1	1	1	1	1	1	1		146	18
Weapons Fab. & Test.		3,443	582	284	90	57	40	23	8	8	5	3	2	4	4		4,553	607
Other		197	2	1	2									1			203	9
Total Persons	0	6,393	717	326	111	70	55	24	14	12	5	3	3	5	6		7,744	
Total Person-rem	0	152	110	113	68	61	66	41	30	33	16	11	12	24	52		788	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.38
Distribution of Internal Dose by Facility Type and Dose Range^(a)
1990 - Female

Facility Type	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem				
	< Meas.	0.10- <0.10	0.25- 0.10-0.25	0.50- 0.25-0.50	0.75- 0.50-0.75	1.00- 0.75-1.00	1.5- 1.0-1.5	2.0- 1.5-2.0	2.5- 2.0-2.5	3.0- 2.5-3.0	3.5- 3.0-3.5			4.0- 3.5-4.0	4.5- 4.0-4.5	5.0- 4.5-5.0	≥ 5
Accelerator																1	1
Fuel/Uran. Enrichment	61		2													63	1
Fuel Fabrication	3	1														4	
Fuel Processing	19	2														21	1
Maint. and Support	235	5	3													243	5
Reactor	92															92	2
Research, General	49	5	2		1											57	4
Research, Fusion	2															2	
Waste Proc./Management	24	1														25	
Weapons Fab. & Test.	850	63	6	1												920	35
Other	62															62	1
Total Persons	0	1,398	79	11	1	1	0	0	0	0	0	0	0	0	0	1,490	0
Total Person-rem	0	33	12	3	1	1	0	0	0	0	0	0	0	0	0	50	0

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.39
Distribution of Internal Dose by Facility Type and Dose Range^(a)
1990 - Unknown Sex

Facility Type	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem			
	< Meas.	0.10- Meas.-	0.25- 0.10-	0.50- 0.25-	0.75- 0.50-	1.00- 0.75-	1.50- 1.00-	2.00- 1.50-	2.50- 2.00-	3.00- 2.50-	3.50- 3.00-			4.00- 3.50-	4.50- 4.00-	5.00- 4.50-
Weapons Fab. & Test.																15
Other																6
Total Persons	0	21	0	0	0	0	0	0	0	0	0	0	0	0	0	21
Total Person-rem	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.40
Distribution of Collective Internal Dose by Facility Type and Dose Range^(a)
1990 - Male

Facility Type	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons-rem				
	< Meas.	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50	3.50-4.00		4.00-4.50	4.50-5.00	≥ 5	
Accelerator															8	
Fuel/Uran. Enrichment	6	2													9	494
Fuel Fabrication	1		1	1	1	1									4	47
Fuel Processing	2	2	1	1	3										9	111
Maint. and Support	21	5	4	2			9	3							43	1,275
Reactor	11	1	1												13	547
Research, General	7	8	4	7	5	13	2	2	6		4			17	75	343
Research, Fusion																17
Waste Proc./Management	2	2	2	1	2	3	2	2	3						18	146
Weapons Fab. & Test.	100	89	99	55	49	48	39	17	22	16	11	8	19	35	607	4,553
Other	2			1									5		9	203
Total Person-rem	0	152	110	113	68	61	66	41	30	33	16	11	12	24	52	788
Total Persons	0	6,393	717	326	111	70	55	24	14	12	5	3	3	5	6	7,744

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.41
Distribution of Collective Internal Dose by Facility Type and Dose Range^(a)
1990 - Female

Facility Type	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem	Total Persons			
	< Meas.	Meas.- <0.10	0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1.00- 1.5	1.5- 2.0	2.0- 2.5	2.5- 3.0	3.0- 3.5			3.5- 4.0	4.0- 4.5	4.5- 5.0
Accelerator																1
Fuel/Uran. Enrichment																1
Fuel Fabrication																4
Fuel Processing																1
Maint. and Support																5
Reactor																2
Research, General																4
Research, Fusion																2
Waste Proc./Management																25
Weapons Fab. & Test.																35
Other																1
Total Person-rem	0	33	12	3	1	1	1	0	0	0	0	0	0	0	0	50
Total Persons	0	1,398	79	11	1	1	1	0	0	0	0	0	0	0	0	1,490

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.42
Distribution of Collective Internal Dose by Facility Type and Dose Range^(a)
1990 - Unknown Sex

Facility Type	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem	Total Persons				
	< Meas.	0.10- Meas.-	0.25- 0.10-	0.50- 0.25-	0.75- 0.50-	1.00- 0.75-	1.5- 1.0-	2.0- 1.5-	2.5- 2.0-	3.0- 2.5-	3.5- 3.0-			4.0- 3.5-	4.5- 4.0-	5.0- 4.5-	≥ 5
Weapons Fab. & Test.																	15
Other																	6
Total Person-rem	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Persons	0	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.43
Distribution of Internal Dose by Age and Dose Range^(a)
1990 - Male

Age Range	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem			
	< Meas.	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50	3.50-4.00			4.00-4.50	4.50-5.00	≥ 5
19 and less															6	
20 - 24															192	
25 - 29			3												541	
30 - 34			10	3	3	1	1								1,076	
35 - 39			17	1	3	3	1	1							1,184	
40 - 44			47	15	4	7	3	1							1,065	
45 - 49			61	19	11	4	2	2	1	1	1				752	
50 - 54			63	25	17	14	5	1	4	1					586	
55 - 59			65	28	23	18	10	3	3	1	1	1			543	
60 - 64			50	16	6	7	3	4	2	1	1				355	
65 and greater			10	3	3	2	1	2			2	1	2		74	
Unknown															19	
Total Persons	0	6,393	717	326	111	70	55	24	14	12	5	3	3	5	6	7,744
Total Person-rem	0	152	110	113	68	61	66	41	30	33	16	11	12	24	52	788

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.44
Distribution of Internal Dose by Age and Dose Range^(a)
1990 - Female

Age Range	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem				
	< Meas.	0.10- <0.10	0.25- 0.25	0.50- 0.50	0.75- 0.75	1.00- 1.00	1.5- 1.5	2.0- 2.0	2.5- 2.5	3.0- 3.0	3.5- 3.5			4.0- 4.0	4.5- 4.5	5.0- 5.0	≥ 5
19 and less																3	
20 - 24																53	1
25 - 29																155	4
30 - 34																280	10
35 - 39																270	18
40 - 44																239	18
45 - 49																151	4
50 - 54																109	12
55 - 59																86	11
60 - 64																43	2
65 and greater																9	9
Total Persons	0	1,398	79	11	1	1	0	0	0	0	0	0	0	0	0	1,490	0
Total Person-rem	0	33	12	3	1	1	0	0	0	0	0	0	0	0	0	50	0

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.45
Distribution of Internal Dose by Age and Dose Range^(a)
1990 - Unknown Sex

Age Range	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem.			
	< Meas.	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50	3.50-4.00			4.00-4.50	4.50-5.00	≥ 5.00
25 - 29																1
30 - 34																3
55 - 59																1
Unknown																16
Total Persons	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21
Total Person-rem	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.46
Distribution of Collective Internal Dose by Age and Dose Range^(a)
1990 - Male

Age Range	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem	Total Persons				
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0			4.0-4.5	4.5-5.0	≥ 5	
19 and less																	
20 - 24	2															2	192
25 - 29	10	3	1													14	565
30 - 34	24	9	3	2	3	2	2	2								44	1,155
35 - 39	28	16	6	1	3	4	2	2		3						62	1,315
40 - 44	25	16	16	10	4	8	5	2								86	1,250
45 - 49	19	19	22	12	9	5	4	4	3	3	4					108	979
50 - 54	16	16	23	15	15	16	8	2	11	3				5	7	137	815
55 - 59	15	17	22	17	20	22	17	6	8	3	4	4		9	15	180	808
60 - 64	10	12	18	10	5	9	5	9	5	3	4			5	8	102	522
65 and greater	2	3	4	2	3	2	2	2	6			8	5	17		53	117
Unknown																1	20
Total Person-rem	0	152	110	113	68	61	66	41	30	33	16	11	12	24	52	788	
Total Persons	0	6,393	717	326	111	70	55	24	14	12	5	3	3	5	6		7,744

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.47
Distribution of Collective Internal Dose by Age and Dose Range^(a)
1990 - Female

Age Range	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem	Total Persons				
	< Meas.	Meas. - <0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5			3.5-4.0	4.0-4.5	4.5-5.0	≥ 5
19 and less																3	
20 - 24		1														1	53
25 - 29		3	1													4	160
30 - 34		6	2													8	291
35 - 39		7	3	1												10	292
40 - 44		6	3		1											9	259
45 - 49		4	1													5	155
50 - 54		3	2	1		1										6	124
55 - 59		2	2													4	97
60 - 64		1														2	47
65 and greater																	9
Total Person-rem	0	33	12	3	1	1	1	0	0	0	0	0	0	0	0	0	50
Total Persons	0	1,398	79	11	1	1	1	0	0	0	0	0	0	0	0	0	1,490

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.48
Distribution of Collective Internal Dose by Age and Dose Range^(a)
1990 - Unknown Sex

Age Range	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem	Total Persons				
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0			4.0-4.5	4.5-5.0	≥ 5	
25 - 29																	1
30 - 34																	3
55 - 59																	1
Unknown																	16
Total Person-rem	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Persons	0	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.49
Distribution of Internal Dose by Occupation and Dose Range^(a)
1990 - Male

Occupation	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)													Total Persons	Total Person-rem	
	< Meas.	0.10- Meas.- <0.10	0.25- 0.50	0.50- 0.75	0.75- 1.00	1.00- 1.50	1.50- 2.00	2.00- 2.50	2.50- 3.00	3.00- 3.50	3.50- 4.00	4.00- 4.50	4.50- 5.00			≥ 5
Unknown		624	72	20	13	7	12	3	1	3	1	1		2	758	98
Management		630	124	58	24	10	10	3	1	2	2	1	1	1	867	127
Scientists		1,258	163	91	29	26	17	7	2	3	1	1	1	1	1,600	190
Technicians		644	109	85	29	18	9	8	6	2	1	1	2	2	916	181
Service		290	9	11	1	1									312	11
Construction		1,320	49	18	1	2	3	1		1			1	1	1,395	50
Production		1,369	176	39	13	6	4	3	4	1	1	1		1	1,618	122
Transportation		75	10	2											87	4
Laborers		130	2												132	2
Miscellaneous		53	3	2	1										59	2
Total Persons	0	6,393	717	326	111	70	55	24	14	12	5	3	3	5	6	7,744
Total Person-rem	0	152	110	113	68	61	66	41	30	33	16	11	12	24	52	788

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.50
Distribution of Internal Dose by Occupation and Dose Range^(a)
1990 - Female

Occupation	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem				
	< Meas.	0.10- <0.10	0.25- 0.25	0.50- 0.50	0.75- 0.75	1.00- 1.00	1.5- 1.5	2.0- 2.0	2.5- 2.5	3.0- 3.0	3.5- 3.5			4.0- 4.0	4.5- 4.5	5.0- 5.0	≥ 5
Unknown		106	7	4		1										118	6
Management		257	15	2												274	9
Scientists		264	23													287	12
Technicians		224	18	3	1											246	9
Service		99	2													101	2
Construction		104	4	2												110	3
Production		288	9													297	8
Laborers		45	1													46	1
Miscellaneous		11														11	
Total Persons	0	1,398	79	11	1	1	0	0	0	0	0	0	0	0	0	1,490	0
Total Person-rem	0	33	12	3	1	1	0	0	0	0	0	0	0	0	0	50	0

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.51
Distribution of Internal Dose by Occupation and Dose Range^(a)
1990 - Unknown Sex

Occupation	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem			
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50	3.50-4.00			4.00-4.50	4.50-5.00	≥ 5.00
Unknown	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21	0
Total Persons	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21	0
Total Person-rem	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.52
Distribution of Collective Internal Dose by Occupation and Dose Range^(a)
1990 - Male

Occupation	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem				
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0		4.0-4.5	4.5-5.0	≥ 5	
Unknown	15	11	7	8	6	14	5	2	9	4	4	4	4	17	98	758
Management	18	20	21	15	9	12	6	2	5	6	4	4	5	5	127	867
Scientists	33	25	32	18	22	21	12	4	8	3	4	4	5	5	190	1,600
Technicians	21	17	29	18	16	11	13	13	6	3	4	4	9	22	181	916
Service	5	1	4	1	1										11	312
Construction	23	7	6	1	2	4			3				5		50	1,395
Production	33	26	13	8	5	5	5	8	3	3	4	4	8	8	122	1,618
Transportation	2	2	1												4	87
Laborers	2														2	132
Miscellaneous		1	1	1											2	59
Total Person-rem	0	152	110	113	68	61	66	41	30	33	16	11	12	24	52	788
Total Persons	0	6,393	717	326	111	70	55	24	14	12	5	3	3	5	6	7,744

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.53
Distribution of Collective Internal Dose by Occupation and Dose Range^(a)
1990 - Female

Occupation	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem			
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0		4.0-4.5	4.5-5.0	
Unknown	3	1	1	1	1									6	118
Management	6	2	1											9	274
Scientists	8	4												12	287
Technicians	5	2	1	1										9	246
Service	2													2	101
Construction	2	1	1											3	110
Production	6	2												8	297
Laborers	1													1	46
Miscellaneous															11
Total Person-rem	0	33	12	3	1	1	1	0	0	0	0	0	0	0	50
Total Persons	0	1,398	79	11	1	1	1	0	0	0	0	0	0	0	1,490

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.54
Distribution of Collective Internal Dose by Occupation and Dose Range^(a)
1990 - Unknown Sex

Occupation	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem			
	< Meas.	0.10- Meas.- <0.10	0.25- 0.25	0.50- 0.75	0.75- 1.00	1.0- 1.5	1.5- 2.0	2.0- 2.5	2.5- 3.0	3.0- 3.5	3.5- 4.0		4.0- 4.5	4.5- 5.0	≥ 5
Unknown															21
Total Person-rem	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Persons	0	21	0	0	0	0	0	0	0	0	0	0	0	0	21

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

**TABLE D.55
Distribution of Persons Receiving Internal Dose by Age and Facility Type^(a)
1990 - Male**

Facility Type	Number of Persons Receiving Radiation Doses in Each Age Range													Total Persons	Total Person-rem	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65	Unknown				
Accelerator		1		1	2		3	1							8	
Fuel/Uran. Enrichment		12	42	59	121	115	49	31	25	36	4				494	9
Fuel Fabrication		2	3	9	11	5	2	2	6	7					47	4
Fuel Processing		6	9	20	19	16	3	4	16	18					111	9
Maint. and Support	4	107	172	208	196	177	126	100	115	53	6	11			1,275	43
Reactor		32	123	150	103	54	28	16	19	22					547	13
Research, General		5	17	30	58	32	28	46	60	43	23	1			343	75
Research, Fusion				2	3	2	4	1	3	2					17	
Waste Proc./Management		4	20	27	23	16	10	16	19	9	2				146	18
Weapons Fab. & Test.	1	13	154	607	741	800	710	587	535	322	76	7			4,553	607
Other	1	10	25	42	38	33	16	11	10	10	6	1			203	9
Total Persons	6	192	565	1,155	1,315	1,250	979	815	808	522	117	20			7,744	
Total Person-rem	0	2	14	44	62	86	108	137	180	102	53	1			788	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.56
Distribution of Persons Receiving Internal Dose by Age and Facility Type^(a)
1990 - Female

Facility Type	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem			
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown		
Accelerator						1										1
Fuel/Uran. Enrichment		1	10	10	17	9	3	7	4	2						63
Fuel Fabrication			1	1	1	1										4
Fuel Processing			2	7	7	3		1	1							21
Maint. and Support	1	23	47	66	40	43	12	8		3						243
Reactor		11	17	28	17	13	4		1	1						92
Research, General		1	7	6	18	6	4	10	3	1	1					57
Research, Fusion																2
Waste Proc./Management		2	5	4	4	4	4		1	1						25
Weapons Fab. & Test.	2	4	54	160	177	172	124	95	85	39	8					920
Other		11	17	9	11	6	3	3	2							62
Total Persons	3	53	160	291	292	259	155	124	97	47	9	0	0	0	0	1,490
Total Person-rem	0	1	4	8	10	9	5	6	4	2	0	0	0	0	0	50

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.57
Distribution of Persons Receiving Internal Dose by Age and Facility Type^(a)
1990 - Unknown Sex

Facility Type	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown
Weapons Fab. & Test.			1	1									13	15
Other				2					1				3	6
Total Persons	0	0	1	3	0	0	0	0	1	0	0	0	16	21
Total Person-rem	0	0	0	0	0	0	0	0	0	0	0	0	0	0

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.58
Distribution of Collective Internal Dose by Age and Facility Type^(a)
1990 - Male

Facility Type	Collective Dose Equivalent in Each Age Range											Total Person-rem				
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65		Unknown			
Accelerator																8
Fuel/Uran. Enrichment			1	1	2	2	1	1	1		1					9
Fuel Fabrication								1	1	2	1					4
Fuel Processing				1	2	1				2	2					9
Maint. and Support		2	3	4	6	4	5	6	10	2	2	1				43
Reactor			3	3	2	1	1	1	1	1	1					13
Research, General				2	5	3	2	9	9	12	33	1				75
Research, Fusion																17
Waste Proc./Management				2	2	2	2	6	4		1					18
Weapons Fab. & Test.			6	31	41	73	97	114	151	82	13					607
Other							1		1		5					9
Total Person-rem	0	2	14	44	62	86	108	137	180	102	53	1	1	20	788	7,744
Total Persons	6	192	565	1,155	1,315	1,250	979	815	808	522	117	20	20	20	7,744	7,744

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.59
Distribution of Collective Internal Dose by Age and Facility Type^(a)
1990 - Female

Facility Type	Collective Dose Equivalent in Each Age Range											Total Person-rem	Total Persons					
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown				
Accelerator																	1	
Fuel/Uran. Enrichment																	1	63
Fuel Fabrication																		4
Fuel Processing																	1	21
Maint. and Support					1	1	1	1	1								5	243
Reactor					1												2	92
Research, General										1	2						4	57
Research, Fusion																		2
Waste Proc./Management																		25
Weapons Fab. & Test.					2	5	7	8	4	4	4	2					35	920
Other																	1	62
Total Person-rem	0	1	4	8	10	9	5	6	4	4	2	0	0	0	0	0	50	
Total Persons	3	53	160	291	292	259	155	124	97	47	47	9	0	0	0	0		1,490

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.60
Distribution of Collective Internal Dose by Age and Facility Type^(a)
1990 - Unknown Sex

Facility Type	Collective Dose Equivalent in Each Age Range											Total Person-rem				
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65		Unknown			
Weapons Fab. & Test.																15
Other																6
Total Person-rem	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Persons	0	0	1	3	0	0	0	0	0	1	0	0	0	0	16	21

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.61
Distribution of Persons Receiving Internal Dose by Age and Occupation^(a)
1990 - Male

Occupation	Number of Persons Receiving Radiation Doses in Each Age Range													Total Persons	Total Person-rem
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65	Unknown			
Unknown		9	36	87	93	94	113	108	118	60	32	8	758	98	
Management		2	33	95	151	164	126	122	98	62	14		867	127	
Scientists		29	99	253	247	258	197	182	206	108	21		1,600	190	
Technicians		14	63	152	154	143	114	90	100	74	12		916	181	
Service	1	3	18	72	54	51	33	22	33	22	3		312	11	
Construction	3	91	140	194	232	239	164	126	111	75	9	11	1,395	50	
Production	1	30	147	254	338	252	205	139	127	104	21		1,618	122	
Transportation		1	3	9	12	14	13	14	6	11	4		87	4	
Laborers	1	7	22	34	23	24	8	7	3	2	1		132	2	
Miscellaneous		6	4	5	11	11	6	5	6	4		1	59	2	
Total Persons	6	192	565	1,155	1,315	1,250	979	815	808	522	117	20	7,744		
Total Person-rem	0	2	14	44	62	86	108	137	180	102	53	1	788		

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.62
Distribution of Persons Receiving Internal Dose by Age and Occupation^(a)
1990 - Female

Occupation	Number of Persons Receiving Radiation Doses in Each Age Range													Total Persons	Total Person-rem
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65	Unknown			
Unknown		1	10	16	21	24	13	17	9	6	1			118	6
Management	1	2	8	40	48	49	49	34	29	12	2			274	9
Scientists		8	33	65	65	45	23	23	15	8	2			287	12
Technicians	1	10	37	59	52	44	13	10	10	8	2			246	9
Service		10	12	18	20	14	9	9	8	1				101	2
Construction		10	21	27	21	14	5	4	5	3				110	3
Production	1	10	30	55	55	58	36	21	21	9	1			297	8
Laborers		2	6	11	8	10	4	5						46	1
Miscellaneous			3		2	1	3	1			1			11	
Total Persons	3	53	160	291	292	259	155	124	97	47	9	0	0	1,490	
Total Person-rem	0	1	4	8	10	9	5	6	4	2	0	0	0	50	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.63
Distribution of Persons Receiving Internal Dose by Age and Occupation^(a)
1990 - Unknown Sex

Occupation	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown
Unknown			1	3					1			16	21	
Total Persons	0	0	1	3	0	0	0	0	1	0	0	16	21	
Total Person-rem	0	0	0	0	0	0	0	0	0	0	0	0	0	0

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.64
Distribution of Collective Internal Dose by Age and Occupation^(a)
1990 - Male

Occupation	Collective Dose Equivalent in Each Age Range											Total Person-rem		
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65		Unknown	
Unknown			1	2	6	7	8	13	16	10	35		98	758
Management			1	5	10	13	27	33	24	14	1		127	867
Scientists			2	9	11	18	25	36	64	17	7		190	1,600
Technicians			2	10	12	26	24	29	48	29	2		181	916
Service				1	1	1	1	2	3	2			11	312
Construction		1	3	4	5	6	6	7	11	5	2		50	1,395
Production			5	11	16	13	16	17	14	25	6		122	1,618
Transportation				1		1	1	1					4	87
Laborers													2	132
Miscellaneous												1	2	59
Total Person-rem	0	2	14	44	62	86	108	137	180	102	53	1	788	
Total Persons	6	192	565	1,155	1,315	1,250	979	815	808	522	117	20		7,744

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.65
Distribution of Collective Internal Dose by Age and Occupation^(a)
1990 - Female

Occupation	Collective Dose Equivalent in Each Age Range											Total Person-rem			
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65		Unknown		
Unknown			1	1	1	1	1	2						6	118
Management				1	2	2	1	1	1	1				9	274
Scientists			1	3	2	2	1	1	1	1				12	287
Technicians			1	2	2	2		1	1					9	246
Service														2	101
Construction					1									3	110
Production			1	2	2	1	1		1					8	297
Laborers														1	46
Miscellaneous															11
Total Person-rem	0	1	4	8	10	9	5	6	4	2	0	0	0	50	
Total Persons	3	53	160	291	292	259	155	124	97	47	9	0	0	1,490	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.66
Distribution of Collective Internal Dose by Age and Occupation^(a)
1990 - Unknown Sex

Occupation	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65	Unknown	Total Person-rem	Total Persons
Unknown														21
Total Person-rem	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Persons	0	0	1	3	0	0	0	0	1	0	0	0	16	21

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.67
Distribution of Persons Receiving Internal Dose by Occupation and Facility Type^(a)
1990 - Male

Facility Type	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer	Misc.	Total Persons	Total Person-rem
Accelerator	3	-	2	3								8	
Fuel/Uran. Enrichment	20	62	41	27	15	134	173	3	18	1		494	9
Fuel Fabrication		1	12	3	3	8	20					47	4
- Fuel Processing		1	55			13	42					111	9
Maint. and Support	151	25	71	120	1	777	32	7	91			1,275	43
Reactor		10	198	13	1	105	219	1				547	13
Research, General	154	7	83	81	3	4	3		1	7		343	75
Research, Fusion	17											17	
Waste Proc./Management	12	15	26	24		19	47	2		1		146	18
Weapons Fab. & Test.	382	744	1,032	634	224	334	1,082	74	22	25		4,553	607
Other	19	2	80	11	65	1				25		203	9
Total Persons	758	867	1,600	916	312	0	1,395	1,618	87	132	59	7,744	
Total Person-rem	98	127	190	181	11	0	50	122	4	2	2	788	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.68
Distribution of Persons Receiving Internal Dose by Occupation and Facility Type^(a)
1990 - Female

Facility Type	* * * * * Number of Persons Receiving Radiation Doses in Each Occupation * * * * *											Total Person-rem
	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer	Misc.	
Accelerator			1	-								1
Fuel/Uran. Enrichment	2	10	7	13	4	6	21					63
Fuel Fabrication			3				1					4
Fuel Processing	-		6	1		3	11					21
Maint. and Support	24	10	14	74	1	74	7		39			243
Reactor		2	12	1		7	70					92
Research, General	29	1	5	19		1	1			1		57
Research, Fusion	2											2
Waste Proc./Management	1	1	5	3			15					25
Weapons Fab. & Test.	55	249	229	134	53	19	171		7	3		920
Other	5	1	5	1	43					7		62
Total Persons	118	274	287	246	101	0	297	0	46	11	1,490	
Total Person-rem	6	9	12	9	2	0	8	0	1	0	50	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.69
Distribution of Persons Receiving Internal Dose by Occupation and Facility Type^(a)
1990 - Unknown Sex

Facility Type	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer	Misc.	Total Persons	Total Person-rem
Weapons Fab. & Test.	15											15	
Other	6											6	
Total Persons	21	0	0	0	0	0	0	0	0	0	0	21	
Total Person-rem	0	0	0	0	0	0	0	0	0	0	0	0	0

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.70
Distribution of Collective Internal Dose by Occupation and Facility Type^(a)
1990 - Male

Facility Type	Collective Dose-Equivalent in Each Occupation											Total Person-rem	Total Persons				
	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer	Misc.						
Accelerator																8	
Fuel/Uran. Enrichment		2	1	1			3	2		1						9	494
Fuel Fabrication			1	1	1			1								4	47
Fuel Processing			5				1	3								9	111
Maint. and Support	6	1	9	9			17	1		2						43	1,275
Reactor			5	1			2	5								13	547
Research, General	57	2	8	6	1										2	75	343
Research, Fusion																	17
Waste Proc./Management	2	3	3	4				5								18	146
Weapons Fab. & Test.	32	120	151	160	8		28	104		4						607	4,553
Other			7	1	1											9	203
Total Person-rem	98	127	190	181	11	0	50	122	4	2	2	2	2	2	2	788	
Total Persons	758	867	1,600	916	312	0	1,395	1,618	87	132	59	59	59	59	59	7,744	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.71
Distribution of Collective Internal Dose by Occupation and Facility Type^(a)
1990 - Female

Facility Type	* * * * * Collective Dose-Equivalent in Each Occupation * * * * *											Total Person-rem	Total Persons				
	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Occupation	Production	Transport	Laborer			Misc.			
Accelerator																	1
Fuel/Uran. Enrichment																1	63
Fuel Fabrication																	4
Fuel Processing																1	21
Maint. and Support						2					1					1	243
Reactor												2				2	92
Research, General																4	57
Research, Fusion																	2
Waste Proc./Management																	25
Weapons Fab. & Test.	3	9	10	6	1	1	5									35	920
Other																1	62

Total Person-rem	6	9	12	9	2	0	3	8	0	0	1	0	0	0	0	50	
Total Persons	118	274	287	246	101	0	110	297	0	46	11	1,490					

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.72
Distribution of Collective Internal Dose by Occupation and Facility Type^(a)
1990 - Unknown Sex

Facility Type	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Occupation	Production	Transport	Laborer	Misc.	Total Person-rem	Total Persons
Weapons Fab. & Test.														15
Other														6
Total Person-rem	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Persons	21	0	0	0	0	0	0	0	0	0	0	0	0	21

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.73
Distribution of Penetrating Dose by Facility Type and Dose Range^(a)
1990 - Male

Facility Type	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem				
	< Meas.	0.10- <0.10	0.25- 0.25	0.50- 0.50	0.75- 0.75	1.00- 1.00	1.50- 1.5	2.00- 2.0	2.50- 2.5	3.00- 3.0	3.50- 3.5			4.00- 4.0	4.50- 4.5	5.00- 5.0	≥ 5
Accelerator	3,470	1,505	207	81	26	15	2									5,306	135
Fuel/Uran. Enrichment	3,490	1,571	52	6												5,119	44
Fuel Fabrication	2,084	567	92	45	11	1	1									2,801	54
Fuel Processing	1,676	809	306	162	70	43	19	2	5							3,092	249
Maint. and Support	15,439	5,323	672	339	98	37	26	2								21,936	479
Reactor	1,951	2,876	409	188	91	35	34	27								5,611	373
Research, General	10,585	3,324	443	225	79	45	27	4	1	1						14,734	353
Research, Fusion	862	199	10	1												1,072	7
Waste Proc./Management	2,861	1,187	218	96	26	12	3	1								4,404	129
Weapons Fab. & Test.	10,169	3,634	335	76	16	4										14,234	177
Other	8,744	2,743	128	75	10	14	15	6	8							11,743	170
Total Persons	61,331	23,738	2,872	1,294	427	206	127	42	14	1	0	0	0	0	0	90,052	
Total Person-rem	0	583	446	450	257	178	152	69	31	3	0	0	0	0	0	2,170	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.74
Distribution of Penetrating Dose by Facility Type and Dose Range^(a)
1990 - Female

Facility Type	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem			
	< Meas.	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50			3.50-4.00	4.00-4.50	4.50-5.00
Accelerator	482	124	10	2	2	2	2	1							623	10
Fuel/Uran. Enrichment	892	294	10												1,196	7
Fuel Fabrication	523	79	22	9	1	3									637	12
Fuel Processing	513	153	60	17	5	10	2								760	34
Maint. and Support	4,102	960	127	41	7	4									5,241	65
Reactor	343	238	22	10	5	1									619	15
Research, General	2,673	433	45	35	14	6	6	1							3,213	51
Research, Fusion	92	3													95	
Waste Proc./Management	716	284	28	14	2	1	1								1,046	20
Weapons Fab. & Test.	2,680	676	58	18	2	1									3,435	32
Other	2,229	624	26	5											2,884	18
Total Persons	15,245	3,868	408	151	38	28	9	2	0	0	0	0	0	0	19,749	
Total Person-rem	0	89	62	52	23	24	11	3	0	0	0	0	0	0	264	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.75
Distribution of Penetrating Dose by Facility Type and Dose Range^(a)
1990 - Unknown Sex

Facility Type	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem				
	< Meas.	<0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50			3.50-4.00	4.00-4.50	4.50-5.00	≥ 5
Accelerator	11															18	
Fuel/Uran. Enrichment	6															32	
Maint. and Support	440	143	2													585	2
Research, General	66	110	1													177	2
Weapons Fab. & Test.	278	615	3													896	7
Other	530	795	96	39	27	7	11	6	2							1,513	98
Total Persons	1,331	1,696	102	39	27	7	11	6	2	0	0	0	0	0	0	3,221	
Total Person-rem	0	32	15	14	16	6	13	10	4	0	0	0	0	0	0		111

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.76
Distribution of Collective Penetrating Dose by Facility Type and Dose Range^(a)
1990 - Male

Facility Type	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem				
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0		4.0-4.5	4.5-5.0	≥ 5	
Accelerator	45	31	29	16	13	2									135	5,306
Fuel/Uran. Enrichment	34	9	2												44	5,119
Fuel Fabrication	15	14	15	7	1	1									54	2,801
Fuel Processing	26	51	57	42	37	21	4	11							249	3,092
Maint. and Support	132	105	118	58	31	31	4								479	21,936
Reactor	68	64	68	56	31	43	43								373	5,611
Research, General	75	69	77	48	40	32	7	2	3						353	14,734
Research, Fusion	6	1													7	1,072
Waste Proc./Management	32	34	33	15	10	4	2								129	4,404
Weapons Fab. & Test.	89	49	26	10	3										177	14,234
Other	61	19	26	6	12	18	10	17							170	11,743
Total Person-rem	0	583	446	450	257	178	69	31	3	0	0	0	0	0	2,170	
Total Persons	61,331	23,738	2,872	1,294	427	206	42	14	1	0	0	0	0	0	90,052	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.77
Distribution of Collective Penetrating Dose by Facility Type and Dose Range^(a)
1990 - Female

Facility Type	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem					
	< Meas.	Meas. - <0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50		3.50-4.00	4.00-4.50	4.50-5.00	≥ 5.00	
Accelerator		3	1	1	1	2	2									10	623
Fuel/Uran. Enrichment		6	1													7	1,196
Fuel Fabrication		2	3	3	1	3										12	637
Fuel Processing		4	10	6	3	9	2									34	760
Maint. and Support		24	20	14	4	3										65	5,241
Reactor		5	3	4	3	1										15	619
Research, General		9	7	12	8	5	7	2								51	3,213
Research, Fusion																	95
Waste Proc./Management		7	5	5	1	1	1									20	1,046
Weapons Fab. & Test.		17	8	6	1	1										32	3,435
Other		12	4	2												18	2,884
Total Person-rem	0	89	62	52	23	24	11	3	0	0	0	0	0	0	0	264	
Total Persons	15,245	3,868	408	151	38	28	9	2	0	0	0	0	0	0	0	0	19,749

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.78
Distribution of Collective Penetrating Dose by Facility Type and Dose Range^(a)
1990 - Unknown Sex

Facility Type	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem	Total Persons			
	< Meas.	0.10- Meas.	0.25- 0.50	0.50- 0.75	0.75- 1.00	1.00- 1.5	1.5- 2.0	2.0- 2.5	2.5- 3.0	3.0- 3.5	3.5- 4.0			4.0- 4.5	4.5- 5.0	≥ 5
Accelerator																18
Fuel/Uran. Enrichment																32
Maint. and Support		2														2
Research, General		2														2
Weapons Fab. & Test.		7	1													7
Other	21	14	14	16	6	13	10	4							98	1,513
Total Person-rem	0	32	15	14	16	6	13	10	4	0	0	0	0	0	0	111
Total Persons	1,331	1,696	102	39	27	7	11	6	2	0	0	0	0	0	0	3,221

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.79
Distribution of Penetrating Dose by Age and Dose Range^(a)
1990 - Male

Age Range	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem			
	< Meas.	0.10- <0.10	0.25- 0.10-0.25	0.50- 0.25-0.50	0.75- 0.50-0.75	1.00- 0.75-1.00	1.5- 1.0-1.5	2.0- 1.5-2.0	2.5- 2.0-2.5	3.0- 2.5-3.0	3.5- 3.0-3.5			4.0- 3.5-4.0	4.5- 4.0-4.5	5.0- 4.5-5.0
19 and less	248	68	6												322	2
20 - 24	2,371	1,033	117	47	20	4	2								3,594	76
25 - 29	5,627	2,897	440	207	66	19	9	6	1						9,272	295
30 - 34	8,720	4,024	558	274	88	45	22	4	2						13,737	417
35 - 39	9,639	4,046	544	227	99	47	37	7	5	1					14,652	435
40 - 44	9,453	3,587	416	194	62	32	17	5	2						13,768	319
45 - 49	7,393	2,560	263	128	26	24	15	7	2						10,418	216
50 - 54	6,311	2,030	211	78	22	15	11	7	1						8,686	159
55 - 59	5,228	1,745	185	99	26	15	8	4							7,310	148
60 - 64	3,622	1,150	98	31	12	3	3	2							4,921	70
65 and greater	1,475	312	25	4	3	1									1,820	15
Unknown	1,244	286	9	5	3	1	3		1						1,552	18
Total Persons	61,331	23,738	2,872	1,294	427	206	127	42	14	1	0	0	0	0	90,052	
Total Person-rem	0	583	446	450	257	178	152	69	31	3	0	0	0	0	2,170	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.80
Distribution of Penetrating Dose by Age and Dose Range^(a)
1990 - Female

Age Range	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)																Total Persons	Total Person-rem
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50	3.50-4.00	4.00-4.50	4.50-5.00	≥ 5.00				
19 and less	159	25	1														185	
20 - 24	1,206	346	31	9	2	4											1,598	20
25 - 29	2,120	686	86	25	7	4	2										2,930	46
30 - 34	2,724	830	100	40	8	8	2										3,712	62
35 - 39	2,675	716	76	22	10	7	1										3,507	51
40 - 44	2,228	513	58	24	3	4	1										2,831	35
45 - 49	1,583	281	36	13	2	1	2										1,918	22
50 - 54	1,087	213	15	11	5	2	2										1,333	16
55 - 59	738	117	2	4			1										862	6
60 - 64	370	85	3	3	1												462	4
65 and greater	149	21															170	
Unknown	206	35															241	1
Total Persons	15,245	3,868	408	151	38	28	9	2	0	0	0	0	0	0	0	0	19,749	0
Total Person-rem	0	89	62	52	23	24	11	3	0	0	0	0	0	0	0	0	264	0

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.81
Distribution of Penetrating Dose by Age and Dose Range^(a)
1990 - Unknown Sex

Age Range	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem				
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50	3.50-4.00			4.00-4.50	4.50-5.00	≥ 5.00	
19 and less															14	14	
20 - 24															10	1	11
25 - 29															9	5	14
30 - 34															9	4	14
35 - 39															7		7
40 - 44															8		8
45 - 49															3	1	4
50 - 54															3	1	4
55 - 59															4	2	6
60 - 64															3	1	4
65 and greater															49	21	78
Unknown															1,212	1,660	3,057
Total Persons	1,331	1,696	102	39	27	7	11	6	2	2	0	0	0	0	0	3,221	
Total Person-rem	0	32	15	14	16	6	13	10	4	0	0	0	0	0	0	111	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.82
Distribution of Collective Penetrating Dose by Age and Dose Range^(a)
1990 - Male

Age Range	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem				
	< Meas.	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50	3.50-4.00		4.00-4.50	4.50-5.00	≥ 5	
19 and less	2	1													2	322
20 - 24	24	18	16	12	3	3									76	3,594
25 - 29	73	70	72	40	16	11	11	2							295	9,272
30 - 34	103	88	97	53	39	26	7	5							417	13,737
35 - 39	101	85	78	59	41	45	11	11	3						435	14,652
40 - 44	89	65	68	37	27	19	8	5							319	13,768
45 - 49	62	40	45	16	21	18	11	4							216	10,418
50 - 54	48	31	27	14	13	14	11	2							159	8,686
55 - 59	41	28	33	16	13	9	6								148	7,310
60 - 64	27	15	11	7	3	4	3								70	4,921
65 and greater	7	4	1	2	1										15	1,820
Unknown	6	1	2	2	1	4		2							18	1,552
Total Person-rem	0	583	446	450	257	178	152	69	31	3	0	0	0	0	0	2,170
Total Persons	61,331	23,738	2,872	1,294	427	206	127	42	14	1	0	0	0	0	0	90,052

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.83
Distribution of Collective Penetrating Dose by Age and Dose Range^(a)
1990 - Female

Age Range	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem	Total Persons				
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0			4.0-4.5	4.5-5.0	≥ 5	
19 and less																	185
- 20 - 24	7	5	3	1	3											20	1,598
25 - 29	15	13	9	4	3	2										46	2,930
30 - 34	20	15	14	5	7	2										62	3,712
35 - 39	18	12	7	6	6	1										51	3,507
40 - 44	12	9	8	2	4		2									35	2,831
45 - 49	7	5	4	1	1	3										22	1,918
50 - 54	5	2	4	3		2										16	1,333
55 - 59	3		2							2						6	862
60 - 64	2		1	1												4	462
65 and greater																	170
Unknown	1															1	241
Total Person-rem	0	89	62	52	23	24	11	3	0	0	0	0	0	0	0	264	
Total Persons	15,245	3,868	408	151	38	28	9	2	0	0	0	0	0	0	0	19,749	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.84
Distribution of Collective Penetrating Dose by Age and Dose Range^(a)
1990 - Unknown Sex

Age Range	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem			
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50	3.50-4.00		4.00-4.50	4.50-5.00	≥ 5.00
19 and less															14
20 - 24															11
25 - 29															14
30 - 34															14
35 - 39															7
40 - 44															8
45 - 49															4
50 - 54															4
55 - 59															6
60 - 64															4
65 and greater	1	1													2
Unknown	31	14	14	16	6	13	10	4							108
Total Person-rem	0	32	15	14	16	6	13	10	4	0	0	0	0	0	111
Total Persons	1,331	1,696	102	39	27	7	11	6	2	0	0	0	0	0	3,221

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.85
Distribution of Penetrating Dose by Occupation and Dose Range^(a)
1990 - Male

Occupation	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)													Total Persons	Total Person-rem		
	< Meas.	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5			4.5-5.0	≥ 5
Unknown	9,904	2,494	256	139	72	51	34	9	9	1						12,969	314
Management	6,040	2,022	150	43	6	4	2									8,267	89
Scientists	19,398	5,958	369	133	41	12	9	7								25,927	287
Technicians	5,725	2,663	602	314	91	43	28	3								9,469	412
Service	4,129	1,622	61	18	3											5,833	51
Agriculture	90	19														109	
Construction	7,489	4,516	604	276	102	44	33	15	5							13,084	485
Production	3,564	2,481	638	271	87	38	14	8								7,101	386
Transportation	1,529	534	38	21	6		2									2,130	32
Laborers	894	587	132	73	19	14	5									1,724	92
Miscellaneous	2,569	842	22	6												3,439	21
Total Persons	61,331	23,738	2,872	1,294	427	206	127	42	14	1	0	0	0	0	0	90,052	
Total Person-rem	0	583	446	450	257	178	152	69	31	3	0	0	0	0	0		2,170

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.86
Distribution of Penetrating Dose by Occupation and Dose Range^(a)
1990 - Female

Occupation	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem				
	< Meas.	Meas. - <0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50			3.50-4.00	4.00-4.50	4.50-5.00	≥ 5
Unknown	2,605	313	22	21	12	7	6	2								2,988	41
Management	4,241	555	21	5	1											4,823	15
Scientists	3,608	780	42	16	3	2										4,451	29
Technicians	1,587	653	114	55	9	6	1									2,425	68
Service	1,191	485	9	3												1,688	12
Agriculture	10	3														13	
Construction	603	311	38	5	2	2	1									962	19
Production	621	481	138	42	8	10	1									1,301	66
Transportation	63	38	1													102	1
Laborers	201	133	21	4	3	1										363	10
Miscellaneous	515	116	2													633	2
Total Persons	15,245	3,868	408	151	38	28	9	2	0	0	0	0	0	0	0	19,749	0
Total Person-rem	0	89	62	52	23	24	11	3	0	0	0	0	0	0	0	264	0

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.87
Distribution of Penetrating Dose by Occupation and Dose Range^(a)
1990 - Unknown

Occupation	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem				
	< Meas.	Meas. - <0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50			3.50-4.00	4.00-4.50	4.50-5.00	≥ 5
Unknown	708	1,389	98	39	27	7	11	6	2							2,287	106
Scientists	18	7														25	
Technicians	3	1														4	
Service	14	13														27	
Construction	437	143	2													582	2
Laborers	1	1														2	
Miscellaneous	150	142	2													294	3
Total Persons	1,331	1,696	102	39	27	7	11	6	2	0	0	0	0	0	0	3,221	
Total Person-rem	0	32	15	14	16	6	13	10	4	0	0	0	0	0	0		111

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.88
Distribution of Collective Penetrating Dose by Occupation and Dose Range^(a)
1990 - Male

Occupation	Collective Dose-Equivalent in Each Dose Range (rem)														Total Person-rem		
	< Meas.	0.10- <0.10	0.25- 0.25	0.50- 0.50	0.75- 0.75	1.00- 1.00	1.5- 1.5	2.0- 2.0	2.5- 2.5	3.0- 3.0	3.5- 3.5	4.0- 4.0	4.5- 4.5	5.0- 5.0		≥ 5	
Unknown	60	40	49	43	45	40	15	20	3							314	12,969
Management	43	23	14	3	4	2										89	8,267
Scientists	126	55	46	25	10	12	12									287	25,927
Technicians	76	96	109	56	37	34	5									412	9,469
Service	35	9	6	2												51	5,833
Agriculture																	109
Construction	120	93	98	61	38	40	25	11								485	13,084
Production	78	101	94	52	32	16	12									386	7,101
Transportation	13	5	8	3												32	2,130
Laborers	17	22	25	12	12	5										92	1,724
Miscellaneous	16	3	2													21	3,439
Total Person-rem	0	583	446	450	257	178	69	31	3	0	0	0	0	0	0	2,170	
Total Persons	61,331	23,738	2,872	1,294	427	206	42	14	1	0	0	0	0	0	0	90,052	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.89
Distribution of Collective Penetrating Dose by Occupation and Dose Range^(a)
1990 - Female

Occupation	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem				
	< Meas.	Meas. - <0.10	0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1.00- 1.5	1.5- 2.0	2.0- 2.5	2.5- 3.0	3.0- 3.5		3.5- 4.0	4.0- 4.5	4.5- 5.0	≥ 5
Unknown		6	3	7	7	6	7	3							41	2,988
Management		10	3	2	1										15	4,823
Scientists		15	6	5	2	2									29	4,451
Technicians		19	18	20	5	5	1								68	2,425
Service		10	1	1											12	1,688
Agriculture																13
Construction		8	6	2	1	2	1								19	962
Production		16	22	15	5	8	1								66	1,301
Transportation		1													1	102
Laborers		3	3	1	2	1									10	363
Miscellaneous		2													2	633
Total Person-rem	0	89	62	52	23	24	11	3	0	0	0	0	0	0	0	264
Total Persons	15,245	3,868	408	151	38	28	9	2	0	0	0	0	0	0	0	19,749

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.90
Distribution of Collective Penetrating Dose by Occupation and Dose Range^(a)
1990 - Unknown Sex

Occupation	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem	Total Persons			
	< Meas.	0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1.00- 1.5	1.5- 2.0	2.0- 2.5	2.5- 3.0	3.0- 3.5	3.5- 4.0			4.0- 4.5	4.5- 5.0	≥ 5
Unknown	28	14	14	16	6	13	10	4							106	2,287
Scientists																25
Technicians																4
Service																27
Construction															2	582
Laborers																2
Miscellaneous															3	294
Total Person-rem	0	32	15	14	16	6	13	10	4	0	0	0	0	0	111	
Total Persons	1,331	1,696	102	39	27	7	11	6	2	0	0	0	0	0	0	3,221

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.91
Distribution of Persons Receiving Penetrating Radiation Dose by Age and Facility Type^(a)
1990 - Male

Facility Type	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown
Accelerator	30	240	612	811	750	734	610	569	431	233	108	178	5,306	135
Fuel/Uran. Enrichment	14	104	299	568	1,014	1,017	642	471	396	408	99	87	5,119	44
Fuel Fabrication	12	170	385	516	471	371	275	217	208	134	42		2,801	54
Fuel Processing	1	175	411	583	535	514	291	212	190	155	25		3,092	249
Maint. and Support	85	1,011	2,446	3,443	3,617	3,313	2,454	2,091	1,764	1,108	386	218	21,936	479
Reactor	3	204	829	980	996	856	563	472	386	262	39	21	5,611	373
Research, General	98	644	1,193	1,973	2,275	2,042	1,768	1,513	1,390	976	518	344	14,734	353
Research, Fusion	1	28	76	134	152	153	140	126	96	79	50	37	1,072	7
Waste Proc./Management	11	193	579	803	760	681	471	407	266	157	53	23	4,404	129
Weapons Fab. & Test.	18	285	963	1,994	2,224	2,350	1,937	1,677	1,444	896	235	211	14,234	177
Other	49	540	1,479	1,932	1,858	1,737	1,267	931	739	513	265	433	11,743	170
Total Persons	322	3,594	9,272	13,737	14,652	13,768	10,418	8,686	7,310	4,921	1,820	1,552	90,052	
Total Person-rem	2	76	295	417	435	319	216	159	148	70	15	18		2,170

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.92
Distribution of Persons Receiving Penetrating Radiation Dose by Age and Facility Type^(a)
1990 - Female

Facility Type	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown
Accelerator	17	57	107	120	100	83	48	39	19	10	6	17	623	10
Fuel/Uran. Enrichment	9	82	134	205	252	167	114	86	78	41	12	16	1,196	7
Fuel Fabrication	2	54	109	131	111	109	40	37	23	18	3		637	12
Fuel Processing	2	80	120	190	135	101	69	38	14	7	4		760	34
Maint. and Support	37	383	803	967	900	795	575	348	235	119	32	47	5,241	65
Reactor	2	66	131	146	104	80	38	20	15	10	2	5	619	15
Research, General	65	274	429	617	578	359	302	226	154	83	46	80	3,213	51
Research, Fusion		5	7	15	13	20	14	5	6	4	3	3	95	
Waste Proc./Management	4	95	202	187	198	145	102	58	26	22	5	2	1,046	20
Weapons Fab. & Test.	18	150	363	606	636	609	390	317	198	104	30	14	3,435	32
Other	29	352	525	528	480	363	226	159	94	44	27	57	2,884	18
Total Persons	185	1,598	2,930	3,712	3,507	2,831	1,918	1,333	862	462	170	241	19,749	
Total Person-rem	0	20	46	62	51	35	22	16	6	4	0	1	264	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.93
Distribution of Persons Receiving Penetrating Dose by Age and Facility Type^(a)
1990 - Unknown Sex

Facility Type	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem		
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown	
Accelerator				1		1						1	15	18	
Fuel/Uran. Enrichment							1						31	32	
Maint. and Support						1							583	585	2
Research, General	13	8	8	1					1	1			145	177	2
Weapons Fab. & Test.	1	2	2	6	3	2	3	2	2	1			872	896	7
Other			3	5	3	6	1	2	3	1		78	1,411	1,513	98
Total Persons	14	11	14	14	7	8	4	4	6	4	78	3,057	3,221		
Total Person-rem	0	0	0	0	0	0	0	0	0	0	2	108	111		

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.94
Distribution of Collective Penetrating Dose by Age and Facility Type^(a)
1990 - Male

Facility Type	Collective Dose Equivalent in Each Age Range											Total Person-rem		
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65		Unknown	
Accelerator		4	14	24	22	23	15	11	14	4	2	2	135	5,306
Fuel/Uran. Enrichment		1	3	8	9	9	5	3	4	3	1		44	5,119
Fuel Fabrication		2	9	12	10	6	4	2	5	3			54	2,801
Fuel Processing		14	47	64	48	36	20	9	8	4			249	3,092
Maint. and Support	1	29	79	97	89	70	43	33	25	9	1	1	479	21,936
Reactor		8	48	63	82	57	47	34	20	15		1	373	5,611
Research, General		6	34	62	84	48	29	32	37	14	5	2	353	14,734
Research, Fusion			1	2	1	1	1	1	1	1			7	1,072
Waste Proc./Management		5	25	31	25	18	10	4	8	3			129	4,404
Weapons Fab. & Test.		2	15	28	29	33	23	17	18	9	3	1	177	14,234
Other		6	21	27	37	19	20	13	10	6	2	11	170	11,743
Total Person-rem	2	76	295	417	435	319	216	159	148	70	15	18	2,170	
Total Persons	322	3,594	9,272	13,737	14,652	13,768	10,418	8,686	7,310	4,921	1,820	1,552	90,052	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.95
Distribution of Collective Penetrating Dose by Age and Facility Type^(a)
1990 - Female

Facility Type	Collective Dose Equivalent in Each Age Range											Total Person-rem		
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65		Unknown	
Accelerator		1	1	1	2	3	1						10	623
Fuel/Uran. Enrichment		1	1	2	2	1	1						7	1,196
Fuel Fabrication		1	1	3	1	4							12	637
Fuel Processing		4	7	13	7	2	1						34	760
Maint. and Support		7	16	17	11	8	3	3	1				65	5,241
Reactor		1	2	4	4	3							15	619
Research, General		1	8	10	10	4	5	7	3	2			51	3,213
Research, Fusion														95
Waste Proc./Management		2	4	3	4	2	5						20	1,046
Weapons Fab. & Test.		1	3	5	7	6	5	3	1	1			32	3,435
Other		3	5	4	2	2	1	1					18	2,884
Total Person-rem	0	20	46	62	51	35	22	16	6	4	0	1	264	
Total Persons	185	1,598	2,930	3,712	3,507	2,831	1,918	1,333	862	462	170	241	19,749	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.96
Distribution of Collective Penetrating Dose by Age and Facility Type^(a)
1990 - Unknown Sex

Facility Type	Collective Dose Equivalent in Each Age Range											Total Person-rem	Total Persons				
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown			
Accelerator																18	
Fuel/Uran. Enrichment																32	
Maint. and Support													2			2	585
Research, General													2			2	177
Weapons Fab. & Test.													7			7	896
Other													2	96		98	1,513
Total Person-rem	0	0	0	0	0	0	0	0	0	0	0	0	2	108		111	
Total Persons	14	11	14	14	7	8	4	4	4	6	4	78	3,057			3,221	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.97
Distribution of Persons Receiving Penetrating Radiation Dose by Age and Occupation^(a)
1990 - Male

Occupation	Number of Persons Receiving Radiation Doses in Each Age Range											≥ 65	Unknown	Total Persons	Total Person-rem
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	65				
Unknown	121	591	1,084	1,791	1,704	1,782	1,677	1,519	1,133	721	414	432	12,969	314	
Management	15	92	356	853	1,367	1,547	1,261	1,122	888	569	150	47	8,267	89	
Scientists	18	870	2,740	3,974	4,150	3,918	3,007	2,583	2,309	1,520	618	220	25,927	287	
Technicians	20	433	1,176	1,736	1,712	1,391	876	710	685	442	102	186	9,469	412	
Service	22	301	1,041	1,224	901	746	473	362	272	190	123	178	5,833	51	
Agriculture		8	11	21	16	18	4	10	11	3	2	5	109		
Construction	59	718	1,390	1,904	2,194	2,180	1,529	1,209	932	689	150	130	13,084	485	
Production	10	207	745	1,119	1,394	1,134	831	562	552	432	91	18	7,101	386	
Transportation	3	44	165	334	403	370	245	211	202	107	23	23	2,130	32	
Laborers	16	95	231	326	317	258	155	113	98	58	11	46	1,724	92	
Miscellaneous	38	235	333	455	494	424	360	285	228	190	130	267	3,439	21	
Total Persons	322	3,594	9,272	13,737	14,652	13,768	10,418	8,686	7,310	4,921	1,820	1,552	90,052		
Total Person-rem	2	76	295	417	435	319	216	159	148	70	15	18		2,170	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.98
Distribution of Persons Receiving Penetrating Radiation Doses by Age and Occupation^(a)
1990 - Female

Occupation	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown
Unknown	69	269	372	455	450	424	340	263	159	80	50	57	2,988	41
Management	22	299	541	739	805	837	618	464	310	126	42	20	4,823	15
Scientists	5	354	886	1,010	838	526	349	212	143	82	30	16	4,451	29
Technicians	20	201	378	547	493	365	165	114	68	47	7	20	2,425	68
Service	12	175	240	330	297	207	147	102	64	57	18	39	1,688	12
Agriculture		1	2	1	3	4		2					13	
Construction	11	115	203	193	175	114	66	32	26	20	1	6	962	19
Production	5	64	153	261	272	220	150	77	59	32	7	1	1,301	66
Transportation		2	15	22	21	15	14	5	3	3	2		102	1
Laborers	12	20	46	61	65	63	40	38	8	5		5	363	10
Miscellaneous	29	98	94	93	88	56	29	24	22	10	13	77	633	2
Total Persons	185	1,598	2,930	3,712	3,507	2,831	1,918	1,333	862	462	170	241	19,749	
Total Person-rem	0	20	46	62	51	35	22	16	6	4	0	1		264

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.99
Distribution of Persons Receiving Penetrating Dose by Age and Occupation^(a)
1990 - Unknown Sex

Occupation	Number of Persons Receiving Radiation Doses in Each Age Range													Total Persons	Total Person-rem
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65	Unknown			
Unknown	1	2	6	12	6	8	4	4	5	2	78	2,159	2,287	106	
Scientists						2						23	25		
Technicians												4	4		
Service												27	27		
Construction		1		1						1		579	582	2	
Laborers												2	2		
Miscellaneous	13	8	6	1	1				1	1		263	294	3	
Total Persons	14	11	14	14	7	8	4	4	6	4	78	3,057	3,221		
Total Person-rem	0	0	0	0	0	0	0	0	0	0	2	108		111	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.100
Distribution of Collective Penetrating Dose by Age and Occupation^(a)
1990 - Male

Occupation	Collective Dose Equivalent in Each Age Range																Total Person-rem
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65	Unknown	*	*	*	*	
Unknown	1	5	27	54	72	42	33	29	25	11	3	11	3	11	314	12,969	
Management		1	8	16	19	16	11	8	6	4	1				89	8,267	
Scientists		7	38	50	50	47	27	24	22	15	5	2			287	25,927	
Technicians		14	68	96	87	49	31	21	33	10	2	2			412	9,469	
Service		2	10	10	8	9	4	3	2	2	1	1			51	5,833	
Agriculture																109	
Construction	1	25	56	82	92	79	57	46	33	13	1				485	13,084	
Production		17	71	77	75	57	38	18	19	13	2				386	7,101	
Transportation		1	2	5	9	4	4	2	4						32	2,130	
Laborers		3	15	23	19	13	10	6	4	1					92	1,724	
Miscellaneous		1	2	4	3	3	2	1	2	1		1			21	3,439	
Total Person-rem	2	76	295	417	435	319	216	159	148	70	15	18			2,170		
Total Persons	322	3,594	9,272	13,737	14,652	13,768	10,418	8,686	7,310	4,921	1,820	1,552			90,052		

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.101
Distribution of Collective Penetrating Dose by Age and Occupation (a)
1990 - Female

Occupation	Collective Dose Equivalent in Each Age Range													Total Person-rem
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65	Unknown		
Unknown		1	7	5	9	5	3	7	2	2	2		41	2,988
Management		1	2	2	2	3	2	2					15	4,823
Scientists		3	5	7	4	4	2	1	1	1	1		29	4,451
Technicians		6	13	21	12	8	5	1	1				68	2,425
Service		2	2	3	2	1	1	1					12	1,688
Agriculture														13
Construction		2	7	5	3	2	1						19	962
Production		4	9	17	15	10	7	2	2				66	1,301
Transportation													1	102
Laborers			1	2	3	2	1	1					10	363
Miscellaneous				1									2	633
Total Person-rem	0	20	46	62	51	35	22	16	6	4	0	1	264	
Total Persons	185	1,598	2,930	3,712	3,507	2,831	1,918	1,333	862	462	170	241	19,749	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.102
Distribution of Collective Penetrating Dose by Age and Occupation^(a)
1990 - Unknown Sex

Occupation	Collective Dose Equivalent in Each Age Range											Total Person-rem			
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65		Unknown		
Unknown												2	103	106	2,287
Scientists															25
Technicians															4
Service															27
Construction													2	2	582
Laborers															2
Miscellaneous													3	3	294
Total Person-rem	0	0	0	0	0	0	0	0	0	0	0	2	108	111	
Total Persons	14	11	14	14	7	8	4	4	6	4	78	3,057	3,221		

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.103
Distribution of Persons Receiving Penetrating Dose by Occupation and Facility Type^(a)
1990 - Male

Facility Type	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer	Misc.	Total Persons	Total Person-rem
Accelerator	1,164	131	2,021	1,402	122	17	139	100	34	1	175	5,306	135
Fuel/Uran. Enrichment	244	790	1,146	512	343	1	1,019	782	46	177	59	5,119	44
Fuel Fabrication	33	254	835	238	135		904	256	41	85	20	2,801	54
Fuel Processing	8	334	1,340	190	43	1	472	611	42	23	28	3,092	249
Maint. and Support	4,412	1,939	3,045	1,277	1,311	25	7,179	1,147	723	829	49	21,936	479
Reactor	21	753	2,285	545	130		640	712	85	61	379	5,611	373
Research, General	2,959	917	5,651	1,904	549	9	505	346	57	110	1,727	14,734	353
Research, Fusion	115	77	443	216	48		104	32		1	36	1,072	7
Waste Proc./Management	109	563	1,434	655	174		733	482	160	55	39	4,404	129
Weapons Fab. & Test.	2,082	1,690	3,731	1,741	840		1,037	2,367	405	242	99	14,234	177
Other	1,822	819	3,996	789	2,138	56	352	266	537	140	828	11,743	170
Total Persons	12,969	8,267	25,927	9,469	5,833	109	13,084	7,101	2,130	1,724	3,439	90,052	
Total Person-rem	314	89	287	412	51	0	485	386	32	92	21		2,170

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.104
Distribution of Persons Receiving Penetrating Dose by Occupation and Facility Type^(a)
1990 - Female

Facility Type	* * * * * Number of Persons Receiving Radiation Doses in Each Occupation * * * * *											Total Persons-rem
	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer	Misc.	
Accelerator	169	71	226	101	41	4	4	4	4	7	623	10
Fuel/Uran. Enrichment	71	464	217	169	81	43	97	3	33	18	1,196	7
Fuel Fabrication	8	154	214	88	23	41	85	3	19	2	637	12
Fuel Processing	1	186	240	57	29	45	197	3	1	1	760	34
Maint. and Support	1,107	1,491	705	620	272	640	140	46	205	15	5,241	65
Reactor	3	163	171	63	21	36	131	2	4	25	619	15
Research, General	775	502	862	536	113	2	36	1	17	353	3,213	51
Research, Fusion	12	29	29	15	6	2				2	95	
Waste Proc./Management	19	228	208	195	195	35	139	14	4	9	1,046	20
Weapons Fab. & Test.	510	1,020	750	380	147	97	440	10	55	26	3,435	32
Other	313	515	829	201	760	11	32	20	25	175	2,884	18
Total Persons	2,988	4,823	4,451	2,425	1,688	13	962	1,301	363	633	19,749	
Total Person-rem	41	15	29	68	12	0	19	66	1	10	2	264

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.105
Distribution of Persons Receiving Penetrating Dose by Occupation and Facility Type^(a)
1990 - Unknown Sex

Facility Type	Number of Persons Receiving Radiation Doses in Each Occupation											Total Persons-rem
	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer	Misc.	
Accelerator	2		11	3	1		1					18
Fuel/Uran. Enrichment	32											32
Maint. and Support					3	581			1			585
Research, General	6		12	1						158		177
Weapons Fab. & Test.	872			22					1			896
Other	1,375		2	1						135		1,513
Total Persons	2,287	0	25	4	27	0	582	0	0	2	294	3,221
Total Person-rem	106	0	0	0	0	0	2	0	0	0	3	111

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.106
Distribution of Collective Penetrating Dose by Occupation and Facility Type^(a)
1990 - Male

Facility Type	* * * * * Collective Dose-Equivalent in Each Occupation * * * * *										Total Person-rem		
	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer		Misc.	
Accelerator	56	1	25	42			2	3	4		1	135	5,306
Fuel/Uran. Enrichment		4	4	3	7		9	10		7		44	5,119
Fuel Fabrication		3	6	8	8		5	21	2	1		54	2,801
Fuel Processing	1	6	34	34	1		64	102	2	4		249	3,092
Maint. and Support	16	16	21	79	11		242	32	10	52		479	21,936
Reactor	1	25	59	81	2		103	85	1	13	5	373	5,611
Research, General	124	10	64	100	6		18	10	2	11	6	353	14,734
Research, Fusion			2	2	1		1	1				7	1,072
Waste Proc./Management	5	7	19	18			26	47	8			129	4,404
Weapons Fab. & Test.	20	15	23	31	2		9	70	1	4	2	177	14,234
Other	90	3	28	14	14		6	7	1	1	6	170	11,743
Total Person-rem	314	89	287	412	51	0	485	386	32	92	21	2,170	
Total Persons	12,969	8,267	25,927	9,469	5,833	109	13,084	7,101	2,130	1,724	3,439	90,052	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.107
Distribution of Collective Penetrating Dose by Occupation and Facility Type^(a)
1990 - Female

Facility Type	* * * * * Collective Dose-Equivalent in Each Occupation * * * * *											Total Person-rem	
	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer	Misc.		
Accelerator	6		1	2								10	623
Fuel/Uran. Enrichment		1	1	1	1		2		1			7	1,196
Fuel Fabrication		1	1				8					12	637
Fuel Processing			5	5	2		21					34	760
Maint. and Support	2	5	3	28	1		5	1	6			65	5,241
Reactor		1	2	6			5		1			15	619
Research, General	27	1	5	13	1		1	1	1			51	3,213
Research, Fusion													95
Waste Proc./Management		2	1	5	1		10					20	1,046
Weapons Fab. & Test.		4	4	6	5		13		1			32	3,435
Other	2		3	3	7						1	18	2,884
Total Person-rem	41	15	29	68	12	0	19	66	1	10	2	264	
Total Persons	2,988	4,823	4,451	2,425	1,688	13	962	1,301	102	363	633		19,749

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.
Total

TABLE D.108
Distribution of Collective Penetrating Dose by Occupation and Facility Type^(a)
1990 - Unknown Sex

Facility Type	Collective Dose-Equivalent in Each Occupation											Total Person-rem	Total Persons
	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer	Misc.		
Accelerator													18
Fuel/Uran. Enrichment													32
Maint. and Support						2						2	585
Research, General										2		2	177
Weapons Fab. & Test.	7											7	896
Other	98									1		98	1,513
Total Person-rem	106	0	0	0	0	0	2	0	0	0	0	111	
Total Persons	2,287	0	25	4	27	0	582	0	0	2	294	3,221	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.109
Distribution of Neutron Dose by Facility Type and Dose Range^(a)
1990 - Male

Facility Type	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem			
	< Meas.	0.10- <0.10	0.25- 0.10-0.25	0.50- 0.25-0.50	0.75- 0.50-0.75	1.00- 0.75-1.00	1.5- 1.0-1.5	2.0- 1.5-2.0	2.5- 2.0-2.5	3.0- 2.5-3.0	3.5- 3.0-3.5			4.0- 3.5-4.0	4.5- 4.0-4.5	5.0- 4.5-5.0
Accelerator	4,933	283	64	25	1										5,306	29
Fuel/Uran. Enrichment	5,101	14	4												5,119	1
Fuel Fabrication	2,795	4	2												2,801	
Fuel Processing	2,859	139	53	35	5	1									3,092	29
Maint. and Support	21,135	629	128	39	2		2	1							21,936	58
Reactor	5,504	93	10	4											5,611	5
Research, General	13,984	510	103	76	43	12	5	1							14,734	102
Research, Fusion	1,070	1	1												1,072	
Waste Proc./Management	4,085	201	74	40	3	1									4,404	34
Weapons Fab. & Test.	13,252	884	85	11	1	1									14,234	39
Other	11,396	312	31	4											11,743	15
Total Persons	86,114	3,070	555	234	54	16	7	2	0	0	0	0	0	0	90,052	0
Total Person-rem	0	92	85	77	33	14	8	3	0	0	0	0	0	0		313

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.110
Distribution of Neutron Dose by Facility Type and Dose Range^(a)
1990 - Female

Facility Type	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem				
	< Meas.	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5			3.5-4.0	4.0-4.5	4.5-5.0	≥ 5
Accelerator	602	13	6	1												623	3
Fuel/Uran. Enrichment	1,195	1														1,196	
Fuel Fabrication	635	2														637	
Fuel Processing	703	35	17	3	1	1										760	7
Maint. and Support	5,082	114	33	12												5,241	12
Reactor	616	3														619	
Research, General	3,098	74	14	13	8	4	2									3,213	20
Research, Fusion	93	2														95	
Waste Proc./Management	955	71	9	9	1	1										1,046	9
Weapons Fab. & Test.	3,262	155	15	3												3,435	7
Other	2,854	28	2													2,884	1
Total Persons	19,095	498	96	41	10	4	4	1	0	0	0	0	0	0	0	19,749	0
Total Person-rem	0	14	15	14	6	3	5	2	0	0	0	0	0	0	0	59	0

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.111
Distribution of Neutron Dose by Facility Type and Dose Range^(a)
1990 - Unknown Sex

Facility Type	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem											
	< Meas.	Meas. - <0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50			3.50-4.00	4.00-4.50	4.50-5.00	≥ 5							
Accelerator																18								
Fuel/Uran. Enrichment																32								
Maint. and Support																585								
Research, General																173	4							
Weapons Fab. & Test.																774	121	1						
Other																1,454	40	10	7	2	2		1,513	7
Total Persons	3,036	165	11	7	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,221		
Total Person-rem	0	3	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9		

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.112
Distribution of Collective Neutron Dose by Facility Type and Dose Range^(a)
1990 - Male

Facility Type	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem				
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0		4.0-4.5	4.5-5.0	≥ 5	
Accelerator	11	10	7				1								29	5,306
Fuel/Uran. Enrichment	1	1													1	5,119
Fuel Fabrication																2,801
Fuel Processing	6	9	11	3	1										29	3,092
Maint. and Support	20	20	12	1	3	2									58	21,936
Reactor	2	1	1												5	5,611
Research, General	15	15	28	26	10	6	2								102	14,734
Research, Fusion																1,072
Waste Proc./Management	7	12	13	2	1										34	4,404
Weapons Fab. & Test.	21	13	4	1	1										39	14,234
Other	10	4	1												15	11,743
Total Person-rem	0	92	77	33	14	8	3	0	0	0	0	0	0	0	313	
Total Persons	86,114	3,070	555	234	54	16	7	2	0	0	0	0	0	0	90,052	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.113
Distribution of Collective Neutron Dose by Facility Type and Dose Range^(a)
1990 - Female

Facility Type	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem				
	< Meas.	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50	3.50-4.00		4.00-4.50	4.50-5.00	≥ 5	
Accelerator		1					2								3	623
Fuel/Uran. Enrichment																1,196
Fuel Fabrication																637
Fuel Processing	1	3	1			1									7	760
Maint. and Support	3	5	4												12	5,241
Reactor																619
Research, General	2	2	5	5	3	2									20	3,213
Research, Fusion																95
Waste Proc./Management	2	2	3	1	1										9	1,046
Weapons Fab. & Test.	4	2	1												7	3,435
Other	1														1	2,884
Total Person-rem	0	14	15	14	6	3	5	2	0	0	0	0	0	0	0	59
Total Persons	19,095	498	96	41	10	4	4	1	0	0	0	0	0	0	0	19,749

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.114
Distribution of Collective Neutron Dose by Facility Type and Dose Range^(a)
1990 - Unknown Sex

Facility Type	Collective Dose-Equivalent in Each Dose Range (rem)													Total Person-rem	Total Persons		
	< 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50	3.50-4.00	4.00-4.50	4.50-5.00			≥ 5.00	
Accelerator																18	
Fuel/Uran. Enrichment																32	
Maint. and Support																585	
Research, General																177	
Weapons Fab. & Test.																1	896
Other																7	1,513
Total Person-rem	0	3	2	2	1	0	0	0	0	0	0	0	0	0	0	9	
Total Persons	3,036	165	11	7	2	0	0	0	0	0	0	0	0	0	0		3,221

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.115
Distribution of Neutron Dose by Age and Dose Range^(a)
1990 - Male

Age Range	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem				
	< Meas.	Meas. - <0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50			3.50-4.00	4.00-4.50	4.50-5.00	≥ 5
19 and less	319	3														322	
20 - 24	3,454	110	20	7	2	1										3,594	11
25 - 29	8,780	346	92	41	9	2	1	1								9,272	49
30 - 34	12,997	559	106	59	10	4	1	1								13,737	65
35 - 39	13,963	535	93	42	12	3	4									14,652	59
40 - 44	13,204	448	74	32	9	1										13,768	41
45 - 49	9,997	349	50	18	4											10,418	27
50 - 54	8,326	301	44	12	2	1										8,686	21
55 - 59	7,017	222	46	15	5	4	1									7,310	27
60 - 64	4,762	129	22	7	1											4,921	10
65 and greater	1,757	54	8	1												1,820	3
Unknown	1,538	14														1,552	
Total Persons	86,114	3,070	555	234	54	16	7	2	0	0	0	0	0	0	0	90,052	
Total Person-rem	0	92	85	77	33	14	8	3	0	0	0	0	0	0	0	313	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.116
Distribution of Neutron Dose by Age and Dose Range^(a)
1990 - Female

Age Range	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem				
	< Meas.	<0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50			3.50-4.00	4.00-4.50	4.50-5.00	≥ 5
19 and less	182	2	1													185	
20 - 24	1,559	32	6	1												1,598	2
25 - 29	2,822	77	14	13	3	1										2,930	12
30 - 34	3,567	112	22	9	1	1										3,712	11
35 - 39	3,381	90	26	6	3	1										3,507	12
40 - 44	2,734	81	12	3			1									2,831	6
45 - 49	1,860	44	6	6		2										1,918	7
50 - 54	1,285	35	7	3	1	2										1,333	6
55 - 59	846	14	1			1										862	2
60 - 64	450	9	1	1	1											462	1
65 and greater	168	2														170	
Unknown	241															241	
Total Persons	19,095	498	96	41	10	4	4	1	0	0	0	0	0	0	0	19,749	
Total Person-rem	0	14	15	14	6	3	5	2	0	0	0	0	0	0	0	59	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.117
Distribution of Neutron Dose by Age and Dose Range^(a)
1990 - Unknown Sex

Age Range	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem				
	< Meas.	Meas. - <0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50			3.50-4.00	4.00-4.50	4.50-5.00	≥ 5
19 and less	14															14	
20 - 24	10	1														11	
25 - 29	12	2														14	
30 - 34	13			1												14	
35 - 39	7															7	
40 - 44	8															8	
45 - 49	4															4	
50 - 54	4															4	
55 - 59	6															6	
60 - 64	4															4	
65 and greater	73	5														78	
Unknown	2,881	157	11	6	2											3,057	8
Total Persons	3,036	165	11	7	2	0	0	0	0	0	0	0	0	0	0	3,221	0
Total Person-rem	0	3	2	2	1	0	0	0	0	0	0	0	0	0	0	9	0

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.118
Distribution of Collective Neutron Dose by Age and Dose Range^(a)
1990 - Male

Age Range	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem			
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0		4.0-4.5	4.5-5.0	≥ 5
19 and less															322
20 - 24	3	3	2	1	1										11 3,594
25 - 29	11	14	14	6	2	1	2								49 9,272
30 - 34	17	16	19	6	3	1	2								65 13,737
35 - 39	16	15	14	7	3	4									59 14,652
40 - 44	13	11	10	6	1										41 13,768
45 - 49	10	8	6	3											27 10,418
50 - 54	9	6	4	1	1										21 8,686
55 - 59	7	7	5	3	3	1									27 7,310
60 - 64	3	4	2	1											10 4,921
65 and greater	2	1													3 1,820
Unknown															1,552
Total Person-rem	0	92	85	77	33	14	8	3	0	0	0	0	0	0	313
Total Persons	86,114	3,070	555	234	54	16	7	2	0	0	0	0	0	0	90,052

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.119
Distribution of Collective Neutron Dose by Age and Dose Range^(a)
1990 - Female

Age Range	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem	Total Persons				
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50	3.50-4.00			4.00-4.50	4.50-5.00	≥ 5	
19 and less																	185
20 - 24	1	1		1												2	1,598
25 - 29	2	2	4	2		1										12	2,930
30 - 34	3	3	3	1	1											11	3,712
35 - 39	2	4	2	2		1										12	3,507
40 - 44	2	2	1				2									6	2,831
45 - 49	1	1	2			3										7	1,918
50 - 54	1	1	1	1	2											6	1,333
55 - 59					1											2	862
60 - 64						1										1	462
65 and greater																	170
Unknown																	241
Total Person-rem	0	14	15	14	6	3	5	2	0	0	0	0	0	0	0	59	
Total Persons	19,095	498	96	41	10	4	4	1	0	0	0	0	0	0	0	0	19,749

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.120
Distribution of Collective Neutron Dose by Age and Dose Range^(a)
1990 - Unknown Sex

Age Range	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem	Total Persons			
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0			4.0-4.5	4.5-5.0	≥ 5
19 and less																14
20 - 24																11
25 - 29																14
30 - 34																14
35 - 39																7
40 - 44																8
45 - 49																4
50 - 54																4
55 - 59																6
60 - 64																4
65 and greater																78
Unknown	3	2	2	2	1											8
Total Person-rem	0	3	2	2	1	0	0	0	0	0	0	0	0	0	0	9
Total Persons	3,036	165	11	7	2	0	0	0	0	0	0	0	0	0	0	3,221

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.121
Distribution of Neutron Dose by Occupation and Dose Range^(a)
1990 - Male

Occupation	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Person- rem				
	< Meas.	Meas. - <0.10	0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1.00- 1.5	1.5- 2.0	2.0- 2.5	2.5- 3.0	3.0- 3.5		3.5- 4.0	4.0- 4.5	4.5- 5.0	≥ 5
Unknown	11,894	776	146	94	41	12	5	1							12,969	122
Management	7,976	250	36	5											8,267	13
Scientists	25,330	527	58	11				1							25,927	28
Technicians	8,846	487	99	29	5	1	2								9,469	44
Service	5,610	212	11												5,833	8
Agriculture															109	
Construction	12,750	266	51	17											13,084	23
Production	6,431	451	135	73	8	3									7,101	67
Transportation	2,104	16	5	5											2,130	3
Laborers	1,663	49	12												1,724	3
Miscellaneous	3,401	36	2												3,439	1
Total Persons	86,114	3,070	555	234	54	16	7	2	0	0	0	0	0	0	90,052	
Total Person-rem	0	92	85	77	33	14	8	3	0	0	0	0	0	0	313	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.122
Distribution of Neutron Dose by Occupation and Dose Range^(a)
1990 - Female

Occupation	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem			
	< Meas.	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50			3.50-4.00	4.00-4.50	4.50-5.00
Unknown	2,845	91	23	14	8	4	2	1							2,988	24
Management	4,738	78	5	2											4,823	3
Scientists	4,381	63	6	1											4,451	3
Technicians	2,281	109	24	10			1								2,425	11
Service	1,661	26	1												1,688	1
Agriculture	13														13	
Construction	945	15	1				1								962	2
Production	1,150	103	33	13	2										1,301	14
Transportation	102														102	
Laborers	349	10	3	1											363	1
Miscellaneous	630	3													633	
Total Persons	19,095	498	96	41	10	4	4	1	0	0	0	0	0	0	19,749	0
Total Person-rem	0	14	15	14	6	3	5	2	0	0	0	0	0	0	59	0

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.123
Distribution of Neutron Dose by Occupation and Dose Range^(a)
1990 - Unknown

Occupation	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem			
	< Meas.	0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1.00- 1.50	1.50- 2.00	2.00- 2.50	2.50- 3.00	3.00- 3.50	3.50- 4.00			4.00- 4.50	4.50- 5.00	≥ 5
Unknown	2,107	160	11	7	2										2,287	9
Scientists	25														25	
Technicians	4														4	
Service	26	1													27	
Construction	582														582	
Laborers	2														2	
Miscellaneous	290	4													294	
Total Persons	3,036	165	11	7	2	0	0	3,221	0							
Total Person-rem	0	3	2	2	1	0	0	9	9							

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.124
Distribution of Collective Neutron Dose by Occupation and Dose Range^(a)
1990 - Male

Occupation	Collective Dose-Equivalent in Each Dose Range (rem)													Total Person-rem	Total Persons	
	< Meas.	0.10- <0.10	0.25- 0.25	0.50- 0.50	0.75- 1.00	1.00- 1.50	1.50- 2.00	2.00- 2.50	2.50- 3.00	3.00- 3.50	3.50- 4.00	4.00- 4.50	4.50- 5.00			≥ 5
Unknown	24	23	33	25	10	6	2								122	12,969
Management	6	5	1												13	8,267
Scientists	15	9	4				2								28	25,927
Technicians	14	15	9	3	1	3									44	9,469
Service	6	2													8	5,833
Agriculture																109
Construction	9	8	6												23	13,084
Production	15	21	23	5	3										67	7,101
Transportation		1	2												3	2,130
Laborers	1	2													3	1,724
Miscellaneous	1														1	3,439
Total Person-rem	0	92	85	77	33	14	8	3	0	0	0	0	0	0	313	
Total Persons	86,114	3,070	555	234	54	16	7	2	0	0	0	0	0	0	90,052	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.125
Distribution of Collective Neutron Dose by Occupation and Dose Range^(a)
1990 - Female

Occupation	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem	Total Persons				
	< Meas.	Meas. - <0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5			3.5-4.0	4.0-4.5	4.5-5.0	≥ 5
Unknown		2	4	4	5	5	3	2	2							24	2,988
Management		2	1	1												3	4,823
Scientists		1	1													3	4,451
Technicians		3	4	3				1								11	2,425
Service		1														1	1,688
Agriculture																	13
Construction		1							1							2	962
Production		4	5	4	1											14	1,301
Transportation																	102
Laborers																1	363
Miscellaneous																	633
Total Person-rem	0	14	15	14	6	3	3	5	2	0	0	0	0	0	0	59	
Total Persons	19,095	498	96	41	10	4	4	4	1	0	0	0	0	0	0		19,749

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.126
Distribution of Collective Neutron Dose by Occupation and Dose Range^(a)
1990 - Unknown Sex

Occupation	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem	Total Persons			
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0			4.0-4.5	4.5-5.0	≥ 5
Unknown	3	2	2	2	1										9	2,287
Scientists																25
Technicians																4
Service																27
Construction																582
Laborers																2
Miscellaneous																294
Total Person-rem	0	3	2	2	1	0	0	0	0	0	0	0	0	0	0	9
Total Persons	3,036	165	11	7	2	0	0	0	0	0	0	0	0	0	0	3,221

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.127
Distribution of Persons Receiving Neutron Dose by Age and Facility Type^(a)
1990 - Male

Facility Type	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Unknown	Total Person-rem
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			
Accelerator	30	240	612	811	750	734	610	569	431	233	108	178	5,306	29
Fuel/Uran. Enrichment	14	104	299	568	1,014	1,017	642	471	396	408	99	87	5,119	1
Fuel Fabrication	12	170	385	516	471	371	275	217	208	134	42		2,801	
Fuel Processing	1	175	411	583	535	514	291	212	190	155	25		3,092	29
Maint. and Support	85	1,011	2,446	3,443	3,617	3,313	2,454	2,091	1,764	1,108	386	218	21,936	58
Reactor	3	204	829	980	996	856	563	472	386	262	39	21	5,611	5
Research, General	98	644	1,193	1,973	2,275	2,042	1,768	1,513	1,390	976	518	344	14,734	102
Research, Fusion	1	28	76	134	152	153	140	126	96	79	50	37	1,072	
Waste Proc./Management	11	193	579	803	760	681	471	407	266	157	53	23	4,404	34
Weapons Fab. & Test.	18	285	963	1,994	2,224	2,350	1,937	1,677	1,444	896	235	211	14,234	39
Other	49	540	1,479	1,932	1,858	1,737	1,267	931	739	513	265	433	11,743	15
Total Persons	322	3,594	9,272	13,737	14,652	13,768	10,418	8,686	7,310	4,921	1,820	1,552	90,052	
Total Person-rem	0	11	49	65	59	41	27	21	27	10	3	0	313	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.128
Distribution of Persons Receiving Neutron Dose by Age and Facility Type^(a)
1990 - Female

Facility Type	Number of Persons Receiving Radiation Doses in Each Age Range														Total Persons	Total Person-rem
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65	Unknown				
Accelerator	17	57	107	120	100	83	48	39	19	10	6	17	623	3		
Fuel/Uran. Enrichment	9	82	134	205	252	167	114	86	78	41	12	16	1,196			
Fuel Fabrication	2	54	109	131	111	109	40	37	23	18	3		637			
Fuel Processing	2	80	120	190	135	101	69	38	14	7	4		760	7		
Maint. and Support	37	383	803	967	900	795	575	348	235	119	32	47	5,241	12		
Reactor	2	66	131	146	104	80	38	20	15	10	2	5	619			
Research, General	65	274	429	617	578	359	302	226	154	83	46	80	3,213	20		
Research, Fusion		5	7	15	13	20	14	5	6	4	3	3	95			
Waste Proc./Management	4	95	202	187	198	145	102	58	26	22	5	2	1,046	9		
Weapons Fab. & Test.	18	150	363	606	636	609	390	317	198	104	30	14	3,435	7		
Other	29	352	525	528	480	363	226	159	94	44	27	57	2,884	1		
Total Persons	185	1,598	2,930	3,712	3,507	2,831	1,918	1,333	862	462	170	241	19,749			
Total Person-rem	0	2	12	11	12	6	7	5	2	1	0	0	59			

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

**TABLE D.129
Distribution of Persons Receiving Neutron Dose by Age and Facility Type^(a)
1990 - Unknown Sex**

Facility Type	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem			
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown		
Accelerator				1	1								1	15	18	
Fuel/Uran. Enrichment					1									31	32	
Maint. and Support			1	1										583	585	
Research, General	13	8	8	1					1	1				145	177	
Weapons Fab. & Test.	1	2	2	6	3	2	3	2	2	1				872	896	1
Other			3	5	3	6	1	2	3	1			78	1,411	1,513	7
Total Persons	14	11	14	14	7	8	4	4	6	4	78	3,057	3,221			
Total Person-rem	0	0	0	0	0	0	0	0	0	0	0	8	8			9

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.130
Distribution of Collective Neutron Dose by Age and Facility Type^(a)
1990 - Male

Facility Type	Collective Dose Equivalent in Each Age Range											Total Person-rem	Total Persons		
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown	
Accelerator		1	2	5	6	5	3	3	3	1	1			29	5,306
Fuel/Uran. Enrichment		1												1	5,119
Fuel Fabrication															2,801
Fuel Processing		3	10	8	4	- 2	1							29	3,092
Maint. and Support		2	12	12	11	6	4	4	5	1				58	21,936
Reactor			1	1	1	1	1							5	5,611
Research, General		2	12	22	24	12	8	6	11	4	1			102	14,734
Research, Fusion															1,072
Waste Proc./Management		1	5	7	6	6	2	2	4	1				34	4,404
Weapons Fab. & Test.		1	4	7	6	8	5	3	3	2	1			39	14,234
Other		1	3	3	2	1	1	2	1	1				15	11,743
Total Person-rem	0	11	49	65	59	41	27	21	27	10	3	0		313	
Total Persons	322	3,594	9,272	13,737	14,652	13,768	10,418	8,686	7,310	4,921	1,820	1,552		90,052	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.131
Distribution of Collective Neutron Dose by Age and Facility Type^(a)
1990 - Female

Facility Type	Collective Dose Equivalent in Each Age Range											Total Person-rem	Total Persons			
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown		
Accelerator					1	2									3	623
Fuel/Uran. Enrichment																1,196
Fuel Fabrication																637
Fuel Processing			2	3	1										7	760
Maint. and Support	1	4	2	2	1	1									12	5,241
Reactor																619
Research, General			3	3	5	1	2	4	1	1					20	3,213
Research, Fusion																95
Waste Proc./Management	1	1	1	2	1	1	3								9	1,046
Weapons Fab. & Test.		1	1	1	2	1	1	1							7	3,435
Other															1	2,884

Total Person-rem	0	2	12	11	12	6	7	6	2	1	0	0	0	0	59	
Total Persons	185	1,598	2,930	3,712	3,507	2,831	1,918	1,333	862	462	170	241				19,749

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.132
Distribution of Collective Neutron Dose by Age and Facility Type^(a)
1990 - Unknown Sex

Facility Type	Collective Dose Equivalent in Each Age Range											Total Person-rem	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65		Unknown
Accelerator													18
Fuel/Uran. Enrichment													32
Maint. and Support													585
Research, General													177
Weapons Fab. & Test.												1	1 896
Other												7	7 1,513
Total Person-rem	0	0	0	0	0	0	0	0	0	0	0	8	9
Total Persons	14	11	14	14	7	8	4	4	6	4	78	3,057	3,221

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.133
Distribution of Persons Receiving Neutron Dose by Age and Occupation^(a)
1990 - Male

Occupation	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown
Unknown	121	591	1,084	1,791	1,704	1,782	1,677	1,519	1,133	721	414	432	12,969	122
Management	15	92	356	853	1,367	1,547	1,261	1,122	888	569	150	47	8,267	13
Scientists	18	870	2,740	3,974	4,150	3,918	3,007	2,583	2,309	1,520	618	220	25,927	28
Technicians	20	433	1,176	1,736	1,712	1,391	876	710	685	442	102	186	9,469	44
Service	22	301	1,041	1,224	901	746	473	362	272	190	123	178	5,833	8
Agriculture		8	11	21	16	18	4	10	11	3	2	5	109	
Construction	59	718	1,390	1,904	2,194	2,180	1,529	1,209	932	689	150	130	13,084	23
Production	10	207	745	1,119	1,394	1,134	831	562	552	432	97	18	7,101	67
Transportation	3	44	165	334	403	370	245	211	202	107	23	23	2,130	3
Laborers	16	95	231	326	317	258	155	113	98	58	11	46	1,724	3
Miscellaneous	38	235	333	455	494	424	360	285	228	190	130	267	3,439	1
Total Persons	322	3,594	9,272	13,737	14,652	13,768	10,418	8,686	7,310	4,921	1,820	1,552	90,052	
Total Person-rem	0	11	49	65	59	41	27	21	27	10	3	0		313

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.134
Distribution of Persons Receiving Neutron Dose by Age and Occupation^(a)
1990 - Female

Occupation	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown
Unknown	69	269	372	455	450	424	340	263	159	80	50	57	2,988	24
Management	22	299	541	739	805	837	618	464	310	126	42	20	4,823	3
Scientists	5	354	886	1,010	838	526	349	212	143	82	30	16	4,451	3
Technicians	20	201	378	547	493	365	165	114	68	47	7	20	2,425	11
Service	12	175	240	330	297	207	147	102	64	57	18	39	1,688	1
Agriculture		1	2	1	3	4		2					13	
Construction	11	115	203	193	175	114	66	32	26	20	1	6	962	2
Production	5	64	153	261	272	220	150	77	59	32	7	1	1,301	14
Transportation		2	15	22	21	15	14	5	3	3	2		102	
Laborers	12	20	46	61	65	63	40	38	8	5		5	363	1
Miscellaneous	29	98	94	93	88	56	29	24	22	10	13	77	633	
Total Persons	185	1,598	2,930	3,712	3,507	2,831	1,918	1,333	862	462	170	241	19,749	
Total Person-rem	0	2	12	11	12	6	7	6	2	1	0	0	59	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.135
Distribution of Persons Receiving Neutron Dose by Age and Occupation^(a)
1990 - Unknown Sex

Occupation	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown
Unknown	1	2	6	12	6	8	4	4	5	2	78	2,159	2,287	9
Scientists				2								23	25	
Technicians												4	4	
Service												27	27	
Construction		1		1						1		579	582	
Laborers												2	2	
Miscellaneous	13	8	6	1	1			1		1		263	294	
Total Persons	14	11	14	14	7	8	4	4	6	4	78	3,057	3,221	
Total Person-rem	0	0	0	0	0	0	0	0	0	0	0	8	9	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.136
Distribution of Collective Neutron Dose by Age and Occupation^(a)
1990 - Male

Occupation	Collective Dose Equivalent in Each Age Range											Total Person-rem		
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65		Unknown	
Unknown		3	15	26	28	15	11	9	11	4	1		122	12,969
Management			2	3	2	2	2	1	1	1			13	8,267
Scientists			4	4	5	3	3	3	3	2			28	25,927
Technicians		2	6	11	9	6	3	2	5	1	1		44	9,469
Service		1	2	1	1	1	1						8	5,833
Agriculture														109
Construction		1	2	5	3	4	2	2	3	1			23	13,084
Production		4	18	15	10	9	4	2	3	1			67	7,101
Transportation							1	1	1				3	2,130
Laborers				1	1	1							3	1,724
Miscellaneous													1	3,439
Total Person-rem	0	11	49	65	59	41	27	21	27	10	3	0	313	
Total Persons	322	3,594	9,272	13,737	14,652	13,768	10,418	8,686	7,310	4,921	1,820	1,552		90,052

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.137
Distribution of Collective Neutron Dose by Age and Occupation^(a)
1990 - Female

Occupation	Collective Dose Equivalent in Each Age Range													Total Person-rem	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65	Unknown			
Unknown			4	3	6	3	3	2	4	1	1			24	2,988
Management			1		1		1							3	4,823
Scientists			1			1								3	4,451
Technicians			3	3	2	1	2							11	2,425
Service														1	1,688
Agriculture															13
Construction			1											2	962
Production		1	2	4	3	1	2							14	1,301
Transportation															102
Laborers														1	363
Miscellaneous															633
Total Person-rem	0	2	12	11	12	6	7	6	2	1	0	0	0	59	
Total Persons	185	1,598	2,930	3,712	3,507	2,831	1,918	1,333	862	462	170	241		19,749	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.138
Distribution of Collective Neutron Dose by Age and Occupation (a)
1990 - Unknown Sex

Occupation	Collective Dose Equivalent in Each Age Range											Total Person-rem	Total Persons	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown
Unknown												8	9	2,287
Scientists														25
Technicians														4
Service														27
Construction														582
Laborers														2
Miscellaneous														294
Total Person-rem	0	0	0	0	0	0	0	0	0	0	0	8	9	
Total Persons	14	11	14	14	7	8	4	4	6	4	78	3,057		3,221

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.139
Distribution of Persons Receiving Neutron Dose by Occupation and Facility Type^(a)
1990 - Male

Facility Type	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer	Misc.	Total Persons	Total Person-rem
Accelerator	1,164	131	2,021	1,402	122	17	139	100	34	1	175	5,306	29
Fuel/Uran. Enrichment	244	790	1,146	512	343	1	1,019	782	46	177	59	5,119	1
Fuel Fabrication	33	254	835	238	135		904	256	41	85	20	2,801	
Fuel Processing	8	334	1,340	190	43	1	472	611	42	23	28	3,092	29
Maint. and Support	4,412	1,939	3,045	1,277	1,311	25	7,179	1,147	723	829	49	21,936	58
Reactor	21	753	2,285	545	130		640	712	85	61	379	5,611	5
Research, General	2,959	917	5,651	1,904	549	9	505	346	57	110	1,727	14,734	102
Research, Fusion	115	77	443	216	48		104	32		1	36	1,072	
Waste Proc./Management	109	563	1,434	655	174		733	482	160	55	39	4,404	34
Weapons Fab. & Test.	2,082	1,690	3,731	1,741	840		1,037	2,367	405	242	99	14,234	39
Other	1,822	819	3,996	789	2,138	56	352	266	537	140	828	11,743	15
Total Persons	12,969	8,267	25,927	9,469	5,833	109	13,084	7,101	2,130	1,724	3,439	90,052	
Total Person-rem	122	13	28	44	8	0	23	67	3	3	1		313

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.140
Distribution of Persons Receiving Neutron Dose by Occupation and Facility Type^(a)
1990 - Female

Facility Type	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer	Misc.	Total Persons	Total Person-rem
Accelerator	169	71	226	101	41	4	4	4	7	623	3		
Fuel/Uran. Enrichment	71	464	217	169	81	43	97	33	18	1,196			
Fuel Fabrication	8	154	214	88	23	41	85	19	2	637			
Fuel Processing	1	186	240	57	29	45	197	3	1	760	7		
Maint. and Support	1,107	1,491	705	620	272	640	140	46	205	15	5,241	12	
Reactor	3	163	171	63	21	36	131	2	4	25	619		
Research, General	775	502	862	536	113	2	36	1	17	353	3,213	20	
Research, Fusion	12	29	29	15	6	2			2	95			
Waste Proc./Management	19	228	208	195	195	35	139	14	4	9	1,046	9	
Weapons Fab. & Test.	510	1,020	750	380	147	97	440	10	55	26	3,435	7	
Other	313	515	829	201	760	11	32	20	25	175	2,884	1	
Total Persons	2,988	4,823	4,451	2,425	1,688	13	962	1,301	363	633	19,749		
Total Person-rem	24	3	3	11	1	0	2	14	0	1	0	59	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.141
Distribution of Persons Receiving Neutron Dose by Occupation and Facility Type^(a)
1990 - Unknown Sex

Facility Type	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer	Misc.	Total Persons	Total Person-rem
Accelerator	2		11	3	1		1					18	
Fuel/Uran. Enrichment	32											32	
Maint. and Support					3		581			1		585	
Research, General	6		12		1						158	177	
Weapons Fab. & Test.	872				22					1		896	1
Other	1,375		2	1							135	1,513	7
Total Persons	2,287	0	25	4	27	0	582	0	0	2	294	3,221	
Total Person-rem	9	0	0	0	0	0	0	0	0	0	0		9

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.142
Distribution of Collective Neutron Dose by Occupation and Facility Type^(a)
1990 - Male

Facility Type	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer	Misc.	Total Person-rem	Total Persons
Accelerator	18		3	4				1		3		29	5,306
Fuel/Uran. Enrichment				1								1	5,119
Fuel Fabrication													2,801
Fuel Processing			2				3	24				29	3,092
Maint. and Support	11	2	5	15	5		10	7		2		58	21,936
Reactor		1	1	1			1	1				5	5,611
Research, General	80	1	9	10							1	102	14,734
Research, Fusion													1,072
Waste Proc./Management		3	2	6			6	16				34	4,404
Weapons Fab. & Test.	3	4	5	7			1	17		1		39	14,234
Other	10	1	1	1	2							15	11,743
Total Person-rem	122	13	28	44	8	0	23	67	3	3	1	313	
Total Persons	12,969	8,267	25,927	9,469	5,833	109	13,084	7,101	2,130	1,724	3,439		90,052

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.143
Distribution of Collective Neutron Dose by Occupation and Facility Type^(a)
1990 - Female

Facility Type	Collective Dose-Equivalent in Each Occupation										Total Person-rem		
	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer		Misc.	
Accelerator	3											3	623
Fuel/Uran. Enrichment													1,196
Fuel Fabrication													637
Fuel Processing					2	5						7	760
Maint. and Support	1	1		6		2			1			12	5,241
Reactor													619
Research, General	18			1								20	3,213
Research, Fusion													95
Waste Proc./Management						1	2	5				9	1,046
Weapons Fab. & Test.	1			1				2				7	3,435
Other	1											1	2,884
Total Person-rem	24	3	3	11	1	0	2	14	0	1	0	59	
Total Persons	2,988	4,823	4,451	2,425	1,688	13	962	1,301	102	363	633		19,749

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.144
Distribution of Collective Neutron Dose by Occupation and Facility Type^(a)
1990 - Unknown Sex

Facility Type	Collective Dose-Equivalent in Each Occupation										Total Person-rem	Total Persons	
	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer			Misc.
Accelerator												18	
Fuel/Uran. Enrichment												32	
Maint. and Support												585	
Research, General												177	
Weapons Fab. & Test.	1											1	896
Other	7											7	1,513
Total Person-rem	9	0	0	0	0	0	0	0	0	0	0	9	
Total Persons	2,287	0	25	4	27	0	582	0	2	294	0		3,221

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.145
Distribution of Beta-Gamma Dose by Facility Type and Dose Range^(a)
1990 - Male

Facility Type	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)																Total Persons	Total Person-rem
	< Meas.	<0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50	3.50-4.00	4.00-4.50	4.50-5.00	≥ 5			
Accelerator	3,662	1,384	166	66	22	6											5,306	105
Fuel/Uran. Enrichment	3,497	1,566	52	4													5,119	43
Fuel Fabrication	2,085	569	89	45	11	1	1										2,801	54
Fuel Processing	1,678	858	322	123	47	38	19	2	5								3,092	220
Maint. and Support	15,767	5,130	632	270	78	40	19										21,936	421
Reactor	1,980	2,859	400	188	89	35	33	27									5,611	368
Research, General	10,878	3,204	405	178	36	17	14	2									14,734	251
Research, Fusion	863	198	11														1,072	7
Waste Proc./Management	2,970	1,192	156	56	18	9	3										4,404	95
Weapons Fab. & Test.	10,252	3,704	230	38	9	1											14,234	139
Other	8,944	2,578	109	60	9	14	15	6	8								11,743	155
Total Persons	62,576	23,242	2,572	1,028	319	161	104	35	15	0	0	0	0	0	0	0	90,052	0
Total Person-rem	0	557	397	355	194	139	126	57	33	0	0	0	0	0	0	0	1,857	0

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.146
Distribution of Beta-Gamma Dose by Facility Type and Dose Range^(a)
1990 - Female

Facility Type	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem				
	< Meas.	0.10- <0.10	0.25- 0.25	0.50- 0.50	0.75- 0.75	1.00- 1.00	1.5- 1.5	2.0- 2.0	2.5- 2.5	3.0- 3.0	3.5- 3.5			4.0- 4.0	4.5- 4.5	5.0- 5.0	≥ 5
Accelerator	494	116	7	4	1	1										623	7
Fuel/Uran. Enrichment	893	293	10													1,196	7
Fuel Fabrication	523	80	21	9	1	3										637	12
Fuel Processing	515	168	53	10	4	9	1									760	28
Maint. and Support	4,155	942	118	19	3	4										5,241	53
Reactor	343	238	22	10	5	1										619	15
Research, General	2,719	411	47	28	6	2										3,213	30
Research, Fusion	94	1														95	
Waste Proc./Management	758	258	24	6												1,046	11
Weapons Fab. & Test.	2,703	680	43	9												3,435	26
Other	2,249	608	24	3												2,884	16
Total Persons	15,446	3,795	369	98	20	20	1	0	0	0	0	0	0	0	0	19,749	
Total Person-rem	0	86	55	34	12	17	1	0	0	0	0	0	0	0	0	205	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.147
Distribution of Beta-Gamma Dose by Facility Type and Dose Range^(a)
1990 - Unknown Sex

Facility Type	* * * * * Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem) * * * * *											Total Persons	Total Person-rem				
	< Meas.	Meas. - <0.10	0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1.0- 1.5	1.5- 2.0	2.0- 2.5	2.5- 3.0	3.0- 3.5			3.5- 4.0	4.0- 4.5	4.5- 5.0	≥ 5
Accelerator	11	7														18	
Fuel/Uran. Enrichment	6	26														32	
Maint. and Support	440	143	2													585	2
Research, General	69	107	1													177	2
Weapons Fab. & Test.	315	579	2													896	6
Other	540	807	88	28	25	6	11	6	2							1,513	91
Total Persons	1,381	1,669	93	28	25	6	11	6	2	0	0	0	0	0	0	3,221	
Total Person-rem	0	31	13	10	15	5	13	10	4	0	0	0	0	0	0		102

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.148
Distribution of Collective Beta-Gamma Dose by Facility Type and Dose Range^(a)
1990 - Male

Facility Type	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem				
	< Meas.	0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1.00- 1.5	1.5- 2.0	2.0- 2.5	2.5- 3.0	3.0- 3.5	3.5- 4.0		4.0- 4.5	4.5- 5.0	≥ 5	
Accelerator	39	25	23	13	5										105	5,306
Fuel/Uran. Enrichment	34	8	1												43	5,119
Fuel Fabrication	15	14	15	7	1	1									54	2,801
Fuel Processing	28	52	42	29	33	21	4	11							220	3,092
Maint. and Support	126	98	94	47	34	22									421	21,936
Reactor	67	62	68	55	31	42	43								368	5,611
Research, General	71	64	59	22	15	17		5							251	14,734
Research, Fusion	6	1													7	1,072
Waste Proc./Management	31	23	19	11	8	4									95	4,404
Weapons Fab. & Test.	87	33	13	5	1										139	14,234
Other	54	16	21	6	12	18	10	17							155	11,743
Total Person-rem	0	557	397	355	194	139	126	57	33	0	0	0	0	0	0	1,857
Total Persons	62,576	23,242	2,572	1,028	319	161	104	35	15	0	0	0	0	0	0	90,052

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.149
Distribution of Collective Beta-Gamma Dose by Facility Type and Dose Range^(a)
1990 - Female

Facility Type	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem	Total Persons				
	< Meas.	0.10- Meas.	0.25- 0.10	0.50- 0.25	0.75- 0.50	1.00- 0.75	1.5- 1.0	2.0- 1.5	2.5- 2.0	3.0- 2.5	3.5- 3.0			4.0- 3.5	4.5- 4.0	5.0- 4.5	≥ 5
Accelerator	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	7	623
Fuel/Uran. Enrichment	6	1														7	1,196
Fuel Fabrication	2	3	3	1	3	3	8	1								12	637
Fuel Processing	5	8	3	3	3	8	1									28	760
Maint. and Support	23	18	7	2	3	3										53	5,241
Reactor	4	3	4	3	1											15	619
Research, General	9	7	10	3	2											30	3,213
Research, Fusion																	95
Waste Proc./Management	6	4	2													11	1,046
Weapons Fab. & Test.	16	6	3													26	3,435
Other	12	4	1													16	2,884
Total Person-rem	0	86	55	34	12	17	1	0	0	0	0	0	0	0	0	205	
Total Persons	15,446	3,795	369	98	20	20	1	0	0	0	0	0	0	0	0		19,749

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.150
Distribution of Collective Beta-Gamma Dose by Facility Type and Dose Range^(a)
1990 - Unknown Sex

Facility Type	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem	Total Persons				
	< Meas.	0.10- <0.10	0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1.00- 1.5	1.5- 2.0	2.0- 2.5	2.5- 3.0	3.0- 3.5			3.5- 4.0	4.0- 4.5	4.5- 5.0	≥ 5
Accelerator																18	
Fuel/Uran. Enrichment																32	
Maint. and Support																2	585
Research, General																2	177
Weapons Fab. & Test.																6	896
Other	21	13	10	10	15	5	13	10	4							91	1,513
Total Person-rem	0	31	13	10	15	5	13	10	4	0	0	0	0	0	0	102	
Total Persons	1,381	1,669	93	28	25	6	11	6	2	0	0	0	0	0	0		3,221

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.151
Distribution of Beta-Gamma Dose by Age and Dose Range^(a)
1990 - Male

Age Range	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)													Total Persons	Total Person-rem		
	< Meas.	Meas. - <0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50	3.50-4.00	4.00-4.50			4.50-5.00	≥ 5
19 and less	251	65	6													322	2
20 - 24	2,431	994	114	35	16	3	1									3,594	66
25 - 29	5,761	2,870	411	159	49	11	6	4	1							9,272	247
30 - 34	8,936	3,949	517	221	56	36	18	2	2							13,737	352
35 - 39	9,846	3,978	483	190	75	39	29	6	6							14,652	376
40 - 44	9,624	3,519	373	157	50	24	14	5	2							13,768	277
45 - 49	7,540	2,483	234	96	21	21	14	7	2							10,418	190
50 - 54	6,442	1,964	167	65	17	14	10	6	1							8,686	138
55 - 59	5,314	1,717	168	73	20	9	6	3								7,310	121
60 - 64	3,674	1,131	76	24	9	2	3	2								4,921	61
65 and greater	1,505	294	14	3	3	1										1,820	12
Unknown	1,252	278	9	5	3	1	3	1								1,552	17
Total Persons	62,576	23,242	2,572	1,028	319	161	104	35	15	0	0	0	0	0	0	90,052	
Total Person-rem	0	557	397	355	194	139	126	57	33	0	0	0	0	0	0	1,857	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.152
Distribution of Beta-Gamma Dose by Age and Dose Range^(a)
1990 - Female

Age Range	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem				
	< Meas.	0.10- <0.10	0.25- 0.25	0.50- 0.50	0.75- 0.75	1.00- 1.00	1.50- 1.5	2.00- 2.0	2.50- 2.5	3.00- 3.0	3.50- 3.5			4.00- 4.0	4.50- 4.5	5.00- 5.0	≥ 5
19 and less	162	23														185	
20 - 24	1,223	335	27	8	1	4										1,598	18
25 - 29	2,147	685	81	12	4	1										2,930	34
30 - 34	2,762	819	91	27	6	6	1									3,712	51
35 - 39	2,709	708	68	13	5	4										3,507	39
40 - 44	2,262	496	51	15	3	4										2,831	29
45 - 49	1,600	278	32	8												1,918	15
50 - 54	1,103	205	13	11	1											1,333	10
55 - 59	746	111	1	3	1											862	5
60 - 64	375	81	5	1												462	3
65 and greater	151	19														170	
Unknown	206	35														241	1
Total Persons	15,446	3,795	369	98	20	20	1	0	0	0	0	0	0	0	0	19,749	0
Total Person-rem	0	86	55	34	12	17	1	0	0	0	0	0	0	0	0	205	0

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.153
Distribution of Beta-Gamma Dose by Age and Dose Range^(a)
1990 - Unknown Sex

Age Range	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem			
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50	3.50-4.00			4.00-4.50	4.50-5.00	≥ 5.00
19 and less	14														14	
20 - 24	11														11	
25 - 29	10	4													14	
30 - 34	9	5													14	
35 - 39	7														7	
40 - 44	8														8	
45 - 49	3	1													4	
50 - 54	3	1													4	
55 - 59	4	2													6	
60 - 64	3	1													4	
65 and greater	49	23	6												78	2
Unknown	1,260	1,632	87	28	25	6	11	6	2						3,057	100
Total Persons	1,381	1,669	93	28	25	6	11	6	2	0	0	0	0	0	3,221	
Total Person-rem	0	31	13	10	15	5	13	10	4	0	0	0	0	0		102

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.154
Distribution of Collective Beta-Gamma Dose by Age and Dose Range^(a)
1990 - Male

Age Range	Collective Dose-Equivalent in Each Dose Range (rem)													Total Person-rem	Total Persons		
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50	3.50-4.00	4.00-4.50	4.50-5.00			≥ 5	
19 and less	2	1														2	322
20 - 24	23	18	11	10	3	1										66	3,594
25 - 29	72	64	55	30	9	7	2									247	9,272
30 - 34	99	81	78	34	31	21	3	5								352	13,737
35 - 39	97	75	65	46	34	35	9	13								376	14,652
40 - 44	85	58	55	30	21	16	8	5								277	13,768
45 - 49	58	36	33	13	18	17	11	4								190	10,418
50 - 54	44	25	22	11	12	12	10	2								138	8,686
55 - 59	39	25	24	12	8	7	5									121	7,310
60 - 64	26	12	9	6	2	4	3									61	4,921
65 and greater	6	2	1	2	1											12	1,820
Unknown	5	1	2	2	1	4	2									17	1,552
Total Person-rem	0	557	397	355	194	139	126	57	33	0	0	0	0	0	0	1,857	
Total Persons	62,576	23,242	2,572	1,028	319	161	104	35	15	0	0	0	0	0	0	90,052	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.155
Distribution of Collective Beta-Gamma Dose by Age and Dose Range^(a)
1990 - Female

Age Range	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem	Total Persons				
	< Meas.	0.10- <0.10	0.25- 0.10-0.25	0.50- 0.25-0.50	0.75- 0.50-0.75	1.0- 0.75-1.0	1.5- 1.0-1.5	2.0- 1.5-2.0	2.5- 2.0-2.5	3.0- 2.5-3.0	3.5- 3.0-3.5			4.0- 3.5-4.0	4.5- 4.0-4.5	5.0- 4.5-5.0	≥ 5
19 and less																	185
20 - 24	7	4	3	1	3											18	1,598
25 - 29	15	12	4	2	1											34	2,930
30 - 34	19	13	9	3	5	1										51	3,712
35 - 39	18	10	4	3	3											39	3,507
40 - 44	11	8	5	2	4											29	2,831
45 - 49	7	5	3													15	1,918
50 - 54	4	2	4	1												10	1,333
55 - 59	2		1		1											5	862
60 - 64	2	1														3	462
65 and greater																	170
Unknown	1															1	241
Total Person-rem	0	86	55	34	12	17	1	0	0	0	0	0	0	0	0	205	
Total Persons	15,446	3,795	369	98	20	20	1	0	0	0	0	0	0	0	0	0	19,749

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.156
Distribution of Collective Beta-Gamma Dose by Age and Dose Range^(a)
1990 - Unknown Sex

Age Range	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem	Total Persons				
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50	3.50-4.00			4.00-4.50	4.50-5.00	≥ 5	
19 and less																	14
20 - 24																	11
25 - 29																	14
30 - 34																	14
35 - 39																	7
40 - 44																	8
45 - 49																	4
50 - 54																	4
55 - 59																	6
60 - 64																	4
65 and greater	1	1														2	78
Unknown	30	13	10	15	5	13	10	4								100	3,057
Total Person-rem	0	31	13	10	15	5	13	10	4	0	0	0	0	0	0	102	
Total Persons	1,381	1,669	93	28	25	6	11	6	2	0	0	0	0	0	0		3,221

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.157
Distribution of Beta-Gamma Dose by Occupation and Dose Range^(a)
1990 - Male

Occupation	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Person-rem				
	< Meas.	Meas.-<0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50		3.50-4.00	4.00-4.50	4.50-5.00	≥ 5
Unknown	10,460	2,151	185	94	26	18	21	4	10						12,969	192
Management	6,146	1,965	111	34	5	4	2								8,267	77
Scientists	19,628	5,806	321	110	35	14	7	6							25,927	258
Technicians	5,818	2,689	560	255	82	39	24	2							9,469	367
Service	4,247	1,520	48	15	3										5,833	44
Agriculture	90	19													109	
Construction	7,542	4,549	552	251	93	44	33	15	5						13,084	462
Production	3,616	2,601	597	189	52	27	11	8							7,101	319
Transportation	1,535	533	43	12	5	2									2,130	29
Laborers	901	587	135	64	18	15	4								1,724	89
Miscellaneous	2,593	822	20	4											3,439	20
Total Persons	62,576	23,242	2,572	1,028	319	161	104	35	15	0	0	0	0	0	90,052	0
Total Person-rem	0	557	397	355	194	139	126	57	33	0	0	0	0	0	1,857	1,857

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.158
Distribution of Beta-Gamma Dose by Occupation and Dose Range^(a)
1990 - Female

Occupation	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem				
	< Meas.	<0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5			3.5-4.0	4.0-4.5	4.5-5.0	≥ 5
Unknown	2,674	273	24	11	4	2										2,988	17
Management	4,289	515	16	3												4,823	12
Scientists	3,631	766	39	11	2	2										4,451	27
Technicians	1,615	653	109	36	6	6										2,425	57
Service	1,205	473	7	3												1,688	11
Agriculture	10	3														13	
Construction	606	312	35	5	2	2										962	17
Production	631	514	118	26	4	7	1									1,301	52
Transportation	63	38	1													102	1
Laborers	204	135	18	3	2	1										363	9
Miscellaneous	518	113	2													633	2
Total Persons	15,446	3,795	369	98	20	20	1	0	0	0	0	0	0	0	0	19,749	0
Total Person-rem	0	86	55	34	12	17	1	0	0	0	0	0	0	0	0	205	0

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.159
Distribution of Beta-Gamma Dose by Occupation and Dose Range^(a)
1990 - Unknown

Occupation	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem				
	< Meas.	<0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50			3.50-4.00	4.00-4.50	4.50-5.00	≥ 5
Unknown	754	1,366	89	28	25	6	11	6	2							2,287	97
Scientists	18	7														25	
Technicians	3	1														4	
Service	15	12														27	
Construction	437	143	2													582	2
Laborers	1	1														2	
Miscellaneous	153	139	2													294	3
Total Persons	1,381	1,669	93	28	25	6	11	6	2	0	0	0	0	0	0	3,221	
Total Person-rem	0	31	13	10	15	5	13	10	4	0	0	0	0	0	0		102

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.160
Distribution of Collective Beta-Gamma Dose by Occupation and Dose Range^(a)
1990 - Male

Occupation	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem	Total Persons			
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0			4.0-4.5	4.5-5.0	≥ 5
Unknown	46	29	32	15	15	26	6	22							192	12,969
Management	41	17	11	3	4	2									77	8,267
Scientists	119	48	38	22	12	9	10								258	25,927
Technicians	75	88	88	51	33	28	3								367	9,469
Service	30	7	5	2											44	5,833
Agriculture																109
Construction	119	84	89	56	38	40	25	11							462	13,084
Production	82	93	64	32	23	13	12								319	7,101
Transportation	13	6	4	3		3									29	2,130
Laborers	17	22	22	11	13	4									89	1,724
Miscellaneous	16	3	1												20	3,439
Total Person-rem	0	557	397	355	194	139	126	57	33	0	0	0	0	0	0	1,857
Total Persons	62,576	23,242	2,572	1,028	319	161	104	35	15	0	0	0	0	0	0	90,052

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.161
Distribution of Collective Beta-Gamma Dose by Occupation and Dose Range^(a)
1990 - Female

Occupation	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem			
	< Meas.	0.10- <0.10	0.25- 0.25	0.50- 0.50	0.75- 1.00	1.00- 1.50	1.50- 2.00	2.00- 2.50	2.50- 3.00	3.00- 3.50	3.50- 4.00		4.00- 4.50	4.50- 5.00	≥ 5
Unknown	5	4	4	4	2	2	2	2	3	4	4	5	5	17	2,988
Management	9	2	1											12	4,823
Scientists	14	6	4	1	2									27	4,451
Technicians	18	17	13	4	5									57	2,425
Service	9	1	1											11	1,688
Agriculture															13
Construction	8	5	2	1	2									17	962
Production	16	17	9	2	6	1								52	1,301
Transportation	1													1	102
Laborers	4	3	1	1	1									9	363
Miscellaneous	2													2	633
Total Person-rem	0	86	55	34	12	17	1	0	0	0	0	0	0	0	205
Total Persons	15,446	3,795	369	98	20	20	1	0	0	0	0	0	0	0	19,749

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.162
Distribution of Collective Beta-Gamma Dose by Occupation and Dose Range^(a)
1990 - Unknown Sex

Occupation	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem	Total Persons				
	< Meas.	0.10- <0.10	0.25- 0.25	0.50- 0.50	0.75- 1.00	1.0- 1.5	1.5- 2.0	2.0- 2.5	2.5- 3.0	3.0- 3.5	3.5- 4.0			4.0- 4.5	4.5- 5.0	≥ 5	
Unknown	26	13	10	15	5	13	10	4							97	2,287	
Scientists																25	
Technicians																4	
Service																27	
Construction				2												2	582
Laborers																	2
Miscellaneous				3												3	294
Total Person-rem	0	31	13	10	15	5	13	10	4	0	0	0	0	0	0	102	
Total Persons	1,381	1,669	93	28	25	6	11	6	2	0	0	0	0	0	0	3,221	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.163
Distribution of Persons Receiving Beta-Gamma Dose by Age and Facility Type^(a)
1990 - Male

Facility Type	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown
Accelerator	30	240	612	811	750	734	610	569	431	233	108	178	5,306	105
Fuel/Uran. Enrichment	14	104	299	568	1,014	1,017	642	471	396	408	99	87	5,119	43
Fuel Fabrication	12	170	385	516	471	371	275	217	208	134	42		2,801	54
Fuel Processing	1	175	411	583	535	514	291	212	190	155	25		3,092	220
Maint. and Support	85	1,011	2,446	3,443	3,617	3,313	2,454	2,091	1,764	1,108	386	218	21,936	421
Reactor	3	204	829	980	996	856	563	472	386	262	39	21	5,611	368
Research, General	98	644	1,193	1,973	2,275	2,042	1,768	1,513	1,390	976	518	344	14,734	251
Research, Fusion	1	28	76	134	152	153	140	126	96	79	50	37	1,072	7
Waste Proc./Management	11	193	579	803	760	681	471	407	266	157	53	23	4,404	95
Weapons Fab. & Test.	18	285	963	1,994	2,224	2,350	1,937	1,677	1,444	896	235	211	14,234	139
Other	49	540	1,479	1,932	1,858	1,737	1,267	931	739	513	265	433	11,743	155
Total Persons	322	3,594	9,272	13,737	14,652	13,768	10,418	8,686	7,310	4,921	1,820	1,552	90,052	
Total Person-rem	2	66	247	352	376	277	190	138	121	61	12	17	1,857	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.164
Distribution of Persons Receiving Beta-Gamma Dose by Age and Facility Type^(a)
1990 - Female

Facility Type	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown
Accelerator	17	57	107	120	100	83	48	39	19	10	6	17	623	7
Fuel/Uran. Enrichment	9	82	134	205	252	167	114	86	78	41	12	16	1,196	7
Fuel Fabrication	2	54	109	131	111	109	40	37	23	18	3		637	12
Fuel Processing	2	80	120	190	135	101	69	38	14	7	4		760	28
Maint. and Support	37	383	803	967	900	795	575	348	235	119	32	47	5,241	53
Reactor	2	66	131	146	104	80	38	20	15	10	2	5	619	15
Research, General	65	274	429	617	578	359	302	226	154	83	46	80	3,213	30
Research, Fusion		5	7	15	13	20	14	5	6	4	3	3	95	
Waste Proc./Management	4	95	202	187	198	145	102	58	26	22	5	2	1,046	11
Weapons Fab. & Test.	18	150	363	606	636	609	390	317	198	104	30	14	3,435	26
Other	29	352	525	528	480	363	226	159	94	44	27	57	2,884	16
Total Persons	185	1,598	2,930	3,712	3,507	2,831	1,918	1,333	862	462	170	241	19,749	
Total Person-rem	0	18	34	51	39	29	15	10	5	3	0	1	205	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.165
Distribution of Persons Receiving Beta-Gamma Dose by Age and Facility Type^(a)
1990 - Unknown Sex

Facility Type	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem		
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown	
Accelerator				1						1			15	18	
Fuel/Uran. Enrichment									1				31	32	
Maint. and Support		1		1									583	585	2
Research, General	13	8	8	1					1	1			145	177	2
Weapons Fab. & Test.	1	2	2	6	3	2	3	2	2	1			872	896	6
Other			3	5	3	6	1	2	3	1		78	1,411	1,513	91
Total Persons	14	11	14	14	7	8	4	4	6	4	78	3,057	3,221		
Total Person-rem	0	0	0	0	0	0	0	0	0	0	2	100	102		

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.166
Distribution of Collective Beta-Gamma Dose by Age and Facility Type^(a)
1990 - Male

Facility Type	Collective Dose Equivalent in Each Age Range											Total Person-rem		
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65		Unknown	
Accelerator		3	12	18	16	18	12	8	10	3	2	2	105	5,306
Fuel/Uran. Enrichment		1	3	7	9	8	5	3	4	3	1		43	5,119
Fuel Fabrication		2	9	12	10	6	4	2	5	3			54	2,801
Fuel Processing		10	37	56	44	34	18	9	7	4			220	3,092
Maint. and Support	1	27	68	85	79	64	39	29	20	8	1	1	421	21,936
Reactor		8	47	62	81	56	46	33	20	15		1	368	5,611
Research, General		4	22	40	60	36	21	25	26	10	4	2	251	14,734
Research, Fusion			1	1	1	1	1	1	1	1			7	1,072
Waste Proc./Management		4	19	24	19	12	7	2	4	3			95	4,404
Weapons Fab. & Test.		1	11	21	23	25	18	13	15	7	2	1	139	14,234
Other		5	18	24	35	18	18	11	9	5	1	10	155	11,743
Total Person-rem	2	66	247	352	376	277	190	138	121	61	12	17	1,857	
Total Persons	322	3,594	9,272	13,737	14,652	13,768	10,418	8,686	7,310	4,921	1,820	1,552	90,052	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.167
Distribution of Collective Beta-Gamma Dose by Age and Facility Type^(a)
1990 - Female

Facility Type	Collective Dose Equivalent in Each Age Range											Person-rem	Total Persons		
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown	
Accelerator		1	1	1	1	2	1							7	623
Fuel/Uran. Enrichment			1	2	2	1								7	1,196
Fuel Fabrication			1	3	1	4								12	637
Fuel Processing		4	4	10	6	2	1							28	760
Maint. and Support		6	12	14	9	6	2	2						53	5,241
Reactor		1	2	4	4	3								15	619
Research, General		1	5	7	5	3	3	4	2	1				30	3,213
Research, Fusion															95
Waste Proc./Management		1	2	2	3	1	2							11	1,046
Weapons Fab. & Test.		1	2	4	5	5	3	3	1	1				26	3,435
Other		3	5	4	4	2	2	1	1					16	2,884
Total Person-rem	0	18	34	51	39	29	15	10	5	3	0	1		205	
Total Persons	185	1,598	2,930	3,712	3,507	2,831	1,918	1,333	862	462	170	241		19,749	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.168
Distribution of Collective Beta-Gamma Dose by Age and Facility Type^(a)
1990 - Unknown Sex

Facility Type	Collective Dose Equivalent in Each Age Range											Total Person-rem	Total Persons			
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown		
Accelerator																18
Fuel/Uran. Enrichment.																32
Maint. and Support														2	2	585
Research, General														2	2	177
Weapons Fab. & Test.														6	6	896
Other													2	89	91	1,513
Total Person-rem	0	0	0	0	0	0	0	0	0	0	0	0	2	100	102	
Total Persons	14	11	14	14	7	8	4	4	4	6	4	78	3,057			3,221

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.169
Distribution of Persons Receiving Beta-Gamma Dose by Age and Occupation^(a)
1990 - Male

Occupation	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown
Unknown	121	591	1,084	1,791	1,704	1,782	1,677	1,519	1,133	721	414	432	12,969	192
Management	15	92	356	853	1,367	1,547	1,261	1,122	888	569	150	47	8,267	77
Scientists	18	870	2,740	3,974	4,150	3,918	3,007	2,583	2,309	1,520	618	220	25,927	258
Technicians	20	433	1,176	1,736	1,712	1,391	876	710	685	442	102	186	9,469	367
Service	22	301	1,041	1,224	901	746	473	362	272	190	123	178	5,833	44
Agriculture		8	11	21	16	18	4	10	11	3	2	5	109	
Construction	59	718	1,390	1,904	2,194	2,180	1,529	1,209	932	689	150	130	13,084	462
Production	10	207	745	1,119	1,394	1,134	831	562	552	432	97	18	7,101	319
Transportation	3	44	165	334	403	370	245	211	202	107	23	23	2,130	29
Laborers	16	95	231	326	317	258	155	113	98	58	11	46	1,724	89
Miscellaneous	38	235	333	455	494	424	360	285	228	190	130	267	3,439	20
Total Persons	322	3,594	9,272	13,737	14,652	13,768	10,418	8,686	7,310	4,921	1,820	1,552	90,052	
Total Person-rem	2	66	247	352	376	277	190	138	121	61	12	17	1,857	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.170
Distribution of Persons Receiving Beta-Gamma Dose by Age and Occupation (a)
1990 - Female

Occupation	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown
Unknown	69	269	372	455	450	424	340	263	159	80	50	57	2,988	17
Management	22	299	541	739	805	837	618	464	310	126	42	20	4,823	12
Scientists	5	354	886	1,010	838	526	349	212	143	82	30	16	4,451	27
Technicians	20	201	378	547	493	365	165	114	68	47	7	20	2,425	57
Service	12	175	240	330	297	207	147	102	64	57	18	39	1,688	11
Agriculture		1	2	1	3	4		2					13	
Construction	11	115	203	193	175	114	66	32	26	20	1	6	962	17
Production	5	64	153	261	272	220	150	77	59	32	7	1	1,301	52
Transportation		2	15	22	21	15	14	5	3	3	2		102	1
Laborers	12	20	46	61	65	63	40	38	8	5		5	363	9
Miscellaneous	29	98	94	93	88	56	29	24	22	10	13	77	633	2
Total Persons	185	1,598	2,930	3,712	3,507	2,831	1,918	1,333	862	462	170	241	19,749	
Total Person-rem	0	18	34	51	39	29	15	10	5	3	0	1		205

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.171
Distribution of Persons Receiving Beta-Gamma Dose by Age and Occupation^(a)
1990 - Unknown Sex

Occupation	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown
Unknown	1	2	6	12	6	8	4	4	5	2	78	2,159	2,287	97
Scientists				2								23	25	
Technicians												4	4	
Service												27	27	
Construction		1		1						1		579	582	2
Laborers												2	2	
Miscellaneous	13	8	6	1	1				1	1		263	294	3
Total Persons	14	11	14	14	7	8	4	4	6	4	78	3,057	3,221	
Total Person-rem	0	0	0	0	0	0	0	0	0	0	2	100		102

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.172
Distribution of Collective Beta-Gamma Dose by Age and Occupation^(a)
1990 - Male

Occupation	Collective Dose Equivalent in Each Age Range											Total Person-rem	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65		Unknown
Unknown	1	2	12	29	45	27	22	20	14	7	2	11	192
Management		1	6	14	17	14	10	7	5	3	1		77
Scientists		6	34	46	45	43	24	20	19	13	4	2	258
Technicians		12	61	85	78	43	28	19	28	8	1	2	367
Service		2	7	9	7	8	3	3	2	2		1	44
Agriculture													109
Construction	1	24	54	77	89	75	54	43	30	13	1		462
Production		12	53	62	65	48	33	16	16	12	2		319
Transportation		1	2	5	9	4	3	2	2				29
Laborers		3	15	22	18	12	9	6	3	1			89
Miscellaneous		1	1	3	3	3	2	1	2	1		1	20
Total Person-rem	2	66	247	352	376	277	190	138	121	61	12	17	1,857
Total Persons	322	3,594	9,272	13,737	14,652	13,768	10,418	8,686	7,310	4,921	1,820	1,552	90,052

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.173
Distribution of Collective Beta-Gamma Dose by Age and Occupation^(a)
1990 - Female

Occupation	Collective Dose Equivalent in Each Age Range													Total Person-rem
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65	Unknown		
Unknown		1	3	2	3	2	1	2	1	1	1		17	2,988
Management		1	2	2	2	2	1	2					12	4,823
Scientists		3	5	7	3	4	2	1	1	1			27	4,451
Technicians		6	10	18	11	7	3	1					57	2,425
Service		2	2	2	2	1	1	1					11	1,688
Agriculture														13
Construction		2	5	4	3	2	1						17	962
Production		3	6	12	12	9	5	2	2				52	1,301
Transportation													1	102
Laborers			1	2	3	2	1	1					9	363
Miscellaneous				1									2	633
Total Person-rem	0	18	34	51	39	29	15	10	5	3	0	1	205	
Total Persons	185	1,598	2,930	3,712	3,507	2,831	1,918	1,333	862	462	170	241	19,749	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.174
Distribution of Collective Beta-Gamma Dose by Age and Occupation (a)
1990 - Unknown Sex

Occupation	Collective Dose Equivalent in Each Age Range											Total Person-rem	Total Persons		
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown	
Unknown												2	95	97	2,287
Scientists															25
Technicians															4
Service															27
Construction													2	2	582
Laborers															2
Miscellaneous													3	3	294
Total Person-rem	0	0	0	0	0	0	0	0	0	0	0	2	100	102	
Total Persons	14	11	14	14	7	8	4	4	4	6	4	78	3,057		3,221

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.175
Distribution of Persons Receiving Beta-Gamma Dose by Occupation and Facility Type^(a)
1990 - Male

Facility Type	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer	Misc.	Total Persons	Total Person-rem
Accelerator	1,164	131	2,021	1,402	122	17	139	100	34	1	175	5,306	105
Fuel/Uran. Enrichment	244	790	1,146	512	343	1	1,019	782	46	177	59	5,119	43
Fuel Fabrication	33	254	835	238	135		904	256	41	85	20	2,801	54
Fuel Processing	8	334	1,340	190	43	1	472	611	42	23	28	3,092	220
Maint. and Support	4,412	1,939	3,045	1,277	1,311	25	7,179	1,147	723	829	49	21,936	421
Reactor	21	753	2,285	545	130		640	712	85	61	379	5,611	368
Research, General	2,959	917	5,651	1,904	549	9	505	346	57	110	1,727	14,734	251
Research, Fusion	115	77	443	216	48		104	32		1	36	1,072	7
Waste Proc./Management	109	563	1,434	655	174		733	482	160	55	39	4,404	95
Weapons Fab. & Test.	2,082	1,690	3,731	1,741	840		1,037	2,367	405	242	99	14,234	139
Other	1,822	819	3,996	789	2,138	56	352	266	537	140	828	11,743	155
Total Persons	12,969	8,267	25,927	9,469	5,833	109	13,084	7,101	2,130	1,724	3,439	90,052	
Total Person-rem	192	77	258	367	44	0	462	319	29	89	20		1,857

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.176
Distribution of Persons Receiving Beta-Gamma Dose by Occupation and Facility Type^(a)
1990 - Female

Facility Type	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer	Misc.	Total Persons	Total Person-rem
Accelerator	169	71	226	101	41	4	4	4	7	623	7	7	7
Fuel/Uran. Enrichment	71	464	217	169	81	43	97	33	3	1,196	7	18	7
Fuel Fabrication	8	154	214	88	23	41	85	19	3	637	12	2	12
Fuel Processing	1	186	240	57	29	45	197	1	3	760	28	1	28
Maint. and Support	1,107	1,491	705	620	272	640	140	205	46	5,241	53	15	53
Reactor	3	163	171	63	21	36	131	4	2	619	15	25	15
Research, General	775	502	862	536	113	2	36	17	1	3,213	30	353	30
Research, Fusion	12	29	29	15	6	2	2	95	2	95	2	2	95
Waste Proc./Management	19	228	208	195	195	35	139	4	14	1,046	11	9	11
Weapons Fab. & Test.	510	1,020	750	380	147	97	440	55	10	3,435	26	26	26
Other	313	515	829	201	760	11	32	25	20	2,884	16	175	16
Total Persons	2,988	4,823	4,451	2,425	1,688	13	962	1,301	102	363	633	19,749	
Total Person-rem	17	12	27	57	11	0	17	52	1	9	2	205	205

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.177
Distribution of Persons Receiving Beta-Gamma Dose by Occupation and Facility Type^(a)
1990 - Unknown Sex

Facility Type	Number of Persons Receiving Radiation Doses in Each Occupation											Total Person-rem
	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer	Misc.	
Accelerator	2		11	3	1		1					18
Fuel/Uran. Enrichment	32											32
Maint. and Support					3		581			1		585
Research, General	6		12		1						158	177
Weapons Fab. & Test.	872				22					1		896
Other	1,375		2		1						135	1,513
Total Persons	2,287	0	25	4	27	0	582	0	0	2	294	3,221
Total Person-rem	97	0	0	0	0	0	2	0	0	0	3	102

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.178
Distribution of Collective Beta-Gamma Dose by Occupation and Facility Type^(a)
1990 - Male

Facility Type	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Occupation	Production	Transport	Laborer	Misc.	Person-rem	Total Persons
Accelerator	38	1	22	38			2	1	2			1	105	5,306
Fuel/Uran. Enrichment		4	4	2	7		9	10			7		43	5,119
Fuel Fabrication		3	6	8	8		5	21		2	1		54	2,801
Fuel Processing	1	6	32	34	1		61	78		2	4		220	3,092
Maint. and Support	5	14	16	64	6		231	24		10	50		421	21,936
Reactor	1	24	58	80	1		102	83		1	13		368	5,611
Research, General	45	9	56	90	6		18	10		2	11		251	14,734
Research, Fusion			2	2	1		1	1					7	1,072
Waste Proc./Management	4	3	17	13			19	31		8			95	4,404
Weapons Fab. & Test.	17	11	19	24	2		8	54		1	3		139	14,234
Other	80	2	27	13	12		6	7		1	1		155	11,743
Total Person-rem	192	77	258	367	44	0	462	319	29	89	20	1,857	1,857	
Total Persons	12,969	8,267	25,927	9,469	5,833	109	13,084	7,101	2,130	1,724	3,439	90,052	90,052	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.179
Distribution of Collective Beta-Gamma Dose by Occupation and Facility Type^(a)
1990 - Female

Facility Type	Unknown	Management	Science	Collective Dose-Equivalent in Each Occupation	Service	Agriculture	Constr'n	Production	Transport	Laborer	Misc.	Total Person-rem	Total Persons
Accelerator	3		1	2								7	623
Fuel/Uran. Enrichment		1	1	1				2		1		7	1,196
Fuel Fabrication		1	1					8				12	637
Fuel Processing			5	5			1	17				28	760
Maint. and Support	1	3	3	22	1		14	3	1	6		53	5,241
Reactor			2	6				5		1		15	619
Research, General	9	1	5	12	1		1	1		1		30	3,213
Research, Fusion													95
Waste Proc./Management		1	1	3			1	5				11	1,046
Weapons Fab. & Test.	3	3	4	4				10		1		26	3,435
Other	1		3	3	7						1	16	2,884
Total Person-rem	17	12	27	57	11	0	17	52	1	9	2	205	
Total Persons	2,988	4,823	4,451	2,425	1,688	13	962	1,301	102	363	633		19,749

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.180
Distribution of Collective Beta-Gamma Dose by Occupation and Facility Type^(a)
1990 - Unknown Sex

Facility Type	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Occupation	Production	Transport	Laborer	Misc.	Person-rem	Total Persons
Accelerator														18
Fuel/Uran. Enrichment														32
Maint. and Support							2						2	585
Research, General												2	2	177
Weapons Fab. & Test.	6												6	896
Other	90											1	91	1,513
Total Person-rem	97	0	0	0	0	0	0	2	0	0	0	3	102	
Total Persons	2,287	0	25	4	27	0	582	0	0	0	2	294		3,221

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.181
Distribution of Shallow Dose by Facility Type and Dose Range^(a)
1990 - Male

Facility Type	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)																Total Persons	Total Person-rem
	< Meas.	Meas.- <0.10	0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1.00- 1.5	1.5- 2.0	2.0- 2.5	2.5- 3.0	3.0- 3.5	3.5- 4.0	4.0- 4.5	4.5- 5.0	≥ 5			
Accelerator	3,718	1,334	153	64	27	6	3							1			5,306	114
Fuel/Uran. Enrichment	2,946	2,005	140	26	1		1										5,119	99
Fuel Fabrication	2,028	598	100	49	12	6	4	4									2,801	76
Fuel Processing	1,576	819	292	185	70	49	62	22	6	5	3	1			2		3,092	391
Maint. and Support	14,831	5,711	861	343	102	50	32	3	1	2							21,936	566
Reactor	1,791	2,959	464	205	90	35	36	31									5,611	402
Research, General	10,335	3,628	450	230	34	21	25	4	3	2	1				1		14,734	332
Research, Fusion	859	201	11	1													1,072	7
Waste Proc./Management	2,589	1,456	242	68	29	9	7	4									4,404	143
Weapons Fab. & Test.	8,962	4,073	765	290	89	30	21	3	1								14,234	457
Other	8,441	2,961	161	81	21	11	27	17	12	8	1	1	1				11,743	272
Total Persons	58,076	25,745	3,639	1,542	475	217	218	88	23	17	5	2	1	1	3		90,052	
Total Person-rem	0	727	560	537	287	188	264	145	52	46	15	8	4	5	21		2,859	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.182
Distribution of Shallow Dose by Facility Type and Dose Range^(a)
1990 - Female

Facility Type	* * * * * Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem) * * * * *											Total Persons-rem					
	< Meas.	Meas.-<0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5		3.5-4.0	4.0-4.5	4.5-5.0	≥ 5	
Accelerator	495	113	8	3	1	1	1	1	1	1	1	1	1	1	9	623	9
Fuel/Uran. Enrichment	765	403	26	2												1,196	17
Fuel Fabrication	508	89	26	8	3	3										637	14
Fuel Processing	491	174	-57	20	4	5	8	1								760	39
Maint. and Support	3,987	1,039	163	38	10	4										5,241	76
Reactor	311	260	31	11	3	3										619	18
Research, General	2,622	493	52	35	6	5										3,213	39
Research, Fusion	94	1														95	
Waste Proc./Management	668	332	35	10	1											1,046	20
Weapons Fab. & Test.	2,477	787	128	30	8	2	1	1	1	1						3,435	65
Other	2,148	681	35	10	7	1	1	1								2,884	32
Total Persons	14,566	4,372	561	167	42	24	12	4	0	1	0	0	0	0	0	19,749	0
Total Person-rem	0	118	85	58	24	21	14	7	0	3	0	0	0	0	0	330	0

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.183
Distribution of Shallow Dose by Facility Type and Dose Range^(a)
1990 - Unknown Sex

Facility Type	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem				
	< Meas.	Meas. - <0.10	0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1.0- 1.5	1.5- 2.0	2.0- 2.5	2.5- 3.0	3.0- 3.5			3.5- 4.0	4.0- 4.5	4.5- 5.0	≥ 5
Accelerator	11	7														18	
Fuel/Uran. Enrichment	5	27														32	1
Maint. and Support	440	143	2													585	2
Research, General	68	108	1													177	2
Weapons Fab. & Test.	195	680	18	2											1	896	20
Other	518	823	83	21	22	10	13	9	7	3	1				2	1,513	139
Total Persons	1,237	1,788	104	23	22	10	13	9	7	3	1	0	0	1	3	3,221	
Total Person-rem	0	38	15	8	14	8	17	16	16	8	3	0	0	5	17		165

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.184
Distribution of Collective Shallow Dose by Facility Type and Dose Range^(a)
1990 - Male

Facility Type	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem	Total Persons			
	< Meas.	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50	3.50-4.00			4.00-4.50	4.50-5.00	≥ 5
Accelerator	38	23	22	16	5	4						5			114	5,306
Fuel/Uran. Enrichment	68	20	8	1		1									99	5,119
Fuel Fabrication	17	16	17	8	5	5	6								76	2,801
Fuel Processing	28	46	65	42	43	77	37	14	13	9	4			12	391	3,092
Maint. and Support	159	132	121	60	43	38	5	2	5						566	21,936
Reactor	75	72	74	55	31	45	50								402	5,611
Research, General	86	71	77	21	18	29	6	7	5	3				9	332	14,734
Research, Fusion	6	1													7	1,072
Waste Proc./Management	45	36	23	17	8	8	7								143	4,404
Weapons Fab. & Test.	129	117	100	53	25	25	5	2							457	14,234
Other	75	24	29	13	9	32	30	26	22	3	4	4			272	11,743
Total Person-rem	0	727	560	537	287	188	264	145	52	46	15	8	4	5	21	2,859
Total Persons	58,076	25,745	3,639	1,542	475	217	218	88	23	17	5	2	1	1	3	90,052

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.185
Distribution of Collective Shallow Dose by Facility Type and Dose Range^(a)
1990 - Female

Facility Type	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem	Total Persons			
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50	3.50-4.00			4.00-4.50	4.50-5.00	≥ 5.00
Accelerator	3	1	1	1	1	1	2								9	623
Fuel/Uran. Enrichment	12	4	1												17	1,196
Fuel Fabrication	3	4	3	2	3										14	637
Fuel Processing	6	9	7	2	4	9	2								39	760
Maint. and Support	29	25	12	6	4										76	5,241
Reactor	6	4	4	2	2										18	619
Research, General	12	8	12	4	4										39	3,213
Research, Fusion																95
Waste Proc./Management	10	6	3		1										20	1,046
Weapons Fab. & Test.	23	19	11	5	2	1	2		3						65	3,435
Other	16	5	4	4	1	1	2								32	2,884
Total Person-rem	0	118	85	58	24	21	14	7	0	3	0	0	0	0	330	
Total Persons	14,566	4,372	561	167	42	24	12	4	0	1	0	0	0	0		19,749

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.186
Distribution of Collective Shallow Dose by Facility Type and Dose Range^(a)
1990 - Unknown Sex

Facility Type	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem			
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0		4.0-4.5	4.5-5.0	≥ 5
Accelerator															18
Fuel/Uran. Enrichment	1														1
Maint. and Support	2														2
Research, General	2														2
Weapons Fab. & Test.	11	3	1												20
Other	21	12	7	14	8	17	16	16	8	3		5	12	139	1,513
Total Person-rem	0	38	15	8	14	8	17	16	16	8	3	0	0	5	17
Total Persons	1,237	1,788	104	23	22	10	13	9	7	3	1	0	0	1	3,221

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.187
Distribution of Shallow Dose by Age and Dose Range^(a)
1990 - Male

Age Range	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem				
	< Meas.	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50			3.50-4.00	4.00-4.50	4.50-5.00	≥ 5
19 and less	244	70	7	1												322	3
20 - 24	2,307	1,053	149	52	20	6	5	2								3,594	94
25 - 29	5,353	3,063	495	240	63	21	20	8	6	2					1	9,272	366
30 - 34	8,262	4,272	693	308	92	39	41	17	4	5	1	1	1		1	13,737	550
35 - 39	9,046	4,396	701	281	95	47	55	18	3	7	1	1				14,652	565
40 - 44	8,863	3,966	545	234	79	37	31	9	2	2						13,768	422
45 - 49	6,993	2,777	371	166	46	26	24	13	1	1						10,418	295
50 - 54	5,967	2,271	260	105	32	22	12	11	3	2	1					8,686	225
55 - 59	4,944	1,936	253	109	31	14	17	4	1					1		7,310	197
60 - 64	3,425	1,302	128	38	11	4	8	4	1							4,921	99
65 and greater	1,431	358	22	4	2		1	1	1							1,820	19
Unknown	1,241	281	15	4	4	1	4	1	1							1,552	22
Total Persons	58,076	25,745	3,639	1,542	475	217	218	88	23	17	5	2	1	1	3	90,052	
Total Person-rem	0	727	560	537	287	188	264	145	52	46	15	8	4	5	21		2,859

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.188
Distribution of Shallow Dose by Age and Dose Range^(a)
1990 - Female

Age Range	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons			
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0		4.0-4.5	4.5-5.0	≥ 5
19 and less	158	27													185
20 - 24	1,154	387	39	4	2	3									1,598
25 - 29	2,014	775	110	24	3	1									2,930
30 - 34	2,579	938	129	45	11	3	1								3,712
35 - 39	2,535	809	124	24	8	4	3								3,507
40 - 44	2,142	574	74	25	9	4	1	1							2,831
45 - 49	1,523	327	42	22	2	2									1,918
50 - 54	1,040	249	22	13	5	2	1	1							1,333
55 - 59	717	131	10	3	1										862
60 - 64	358	91	10	2			1								462
65 and greater	145	25													170
Unknown	201	39	1												241
Total Persons	14,566	4,372	561	167	42	24	12	4	0	1	0	0	0	0	19,749
Total Person-rem	0	118	85	58	24	21	14	7	0	3	0	0	0	0	330

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.189
Distribution of Shallow Dose by Age and Dose Range^(a)
1990 - Unknown Sex

Age Range	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem				
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50	3.50-4.00			4.00-4.50	4.50-5.00	≥ 5.00	
19 and less	13	1														14	
20 - 24	11															11	
25 - 29	6	8														14	
30 - 34	8	5	1													14	
35 - 39	4	2	1													7	
40 - 44	2	6														8	
45 - 49		4														4	
50 - 54		4														4	
55 - 59	2	4														6	
60 - 64	2	2														4	
65 and greater	49	23	6													78	2
Unknown	1,140	1,729	96	23	22	10	13	9	7	3	1				3	3,057	162
Total Persons	1,237	1,788	104	23	22	10	13	9	7	3	1	0	0	1	3	3,221	
Total Person-rem	0	38	15	8	14	8	17	16	16	8	3	0	0	5	17		165

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.190
Distribution of Collective Shallow Dose by Age and Dose Range^(a)
1990 - Male

Age Range	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem				
	Meas.-<0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0		4.0-4.5	4.5-5.0	≥ 5	
19 and less	2	1													3	322
20 - 24	26	23	18	12	5	7	3								94	3,594
25 - 29	86	76	83	39	18	24	14	14						6	366	9,272
30 - 34	125	108	108	55	34	51	29	9	13	3	4	4		6	550	13,737
35 - 39	128	108	100	57	41	66	29	7	19	3	4			5	565	14,652
40 - 44	116	85	82	46	32	37	15	5	5						422	13,768
45 - 49	77	57	56	28	22	29	21	2	3						295	10,418
50 - 54	63	39	37	20	19	15	18	7	6	3					225	8,686
55 - 59	53	38	37	19	12	20	6	2	2					9	197	7,310
60 - 64	37	19	14	7	4	10	6	2	2						99	4,921
65 and greater	9	3	1	1	1	1	2	2	2						19	1,820
Unknown	6	2	1	3	1	5	2	2	2						22	1,552
Total Person-rem	0	727	560	537	287	188	264	145	52	46	15	8	4	5	21	2,859
Total Persons	58,076	25,745	3,639	1,542	475	217	218	88	23	17	5	2	1	1	3	90,052

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.191
Distribution of Collective Shallow Dose by Age and Dose Range^(a)
1990 - Female

Age Range	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem	Total Persons				
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0			4.0-4.5	4.5-5.0	≥ 5	
19 and less																	185
20 - 24	10	6	3	2	2	4										26	1,598
25 - 29	21	17	8	2	3	1										51	2,930
30 - 34	26	19	15	6	5	3	2									76	3,712
35 - 39	23	- 19	8	5	3	4										62	3,507
40 - 44	15	11	9	5	4	1	2	3								50	2,831
45 - 49	10	6	8	1	2											27	1,918
50 - 54	7	3	4	3	2	1	2									22	1,333
55 - 59	3	1	1		1											7	862
60 - 64	3	2	1				2									7	462
65 and greater	1															1	170
Unknown	1															1	241
Total Person-rem	0	118	85	58	24	21	14	7	0	3	0	0	0	0	0	330	
Total Persons	14,566	4,372	561	167	42	24	12	4	0	1	0	0	0	0	0		19,749

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.192
Distribution of Collective Shallow Dose by Age and Dose Range^(a)
1990 - Unknown Sex

Age Range	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem	Total Persons				
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0			4.0-4.5	4.5-5.0	≥ 5	
19 and less																	14
20 - 24																	11
25 - 29																	14
30 - 34																	14
35 - 39																	7
40 - 44																	8
45 - 49																	4
50 - 54																	4
55 - 59																	6
60 - 64																	4
65 and greater	1	1														2	78
Unknown	35	14	8	14	8	17	16	16	16	8	3	3	5	17	162	3,057	
Total Person-rem	0	38	15	8	14	8	17	16	16	8	3	3	0	0	5	17	165
Total Persons	1,237	1,788	104	23	22	10	13	9	7	3	1	0	0	1	3		3,221

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.193
Distribution of Shallow Dose by Occupation and Dose Range^(a)
1990 - Male

Occupation	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)																	Total Persons	Total Person-rem
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50	3.50-4.00	4.00-4.50	4.50-5.00	≥ 5.00					
Unknown	9,830	2,674	241	421	36	13	23	12	7	10	1	1	1	1	12,969	273			
Management	5,691	2,305	196	55	10	6	2	1						1	8,267	126			
Scientists	18,599	6,630	439	154	42	16	25	13	5	1	1			2	25,927	406			
Technicians	5,458	2,770	696	324	101	41	56	15	6	1			1		9,469	525			
Service	3,904	1,827	74	18	5	1		3							5,833	75			
Agriculture	86	23													109				
Construction	6,802	4,880	817	319	110	62	55	27	4	4	4				13,084	656			
Production	2,961	2,552	917	417	138	58	43	14				1			7,101	594			
Transportation	1,432	615	53	13	6	3	5	3							2,130	47			
Laborers	789	619	174	95	22	16	8		1						1,724	119			
Miscellaneous	2,524	850	32	26	5	1	1								3,439	36			
Total Persons	58,076	25,745	3,639	1,542	475	217	218	88	23	17	5	2	1	1	3	90,052			
Total Person-rem	0	727	560	537	287	188	264	145	52	46	15	8	4	5	21	2,859			

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.194
Distribution of Shallow Dose by Occupation and Dose Range^(a)
1990 - Female

Occupation	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons-rem				
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0		4.0-4.5	4.5-5.0	≥ 5	
Unknown	2,592	339	33	16	4	3				1					2,988	25
Management	4,125	650	40	5	3										4,823	23
Scientists	3,418	949	58	19	4	1	2								4,451	44
Technicians	1,482	706	148	61	15	6	4	3							2,425	90
Service	1,124	541	17	4	1					1					1,688	20
Agriculture	9	4													13	
Construction	535	363	50	7	3	2	1	1							962	28
Production	543	505	182	46	11	10	4								1,301	81
Transportation	60	39	3												102	2
Laborers	170	155	26	9	1	2									363	14
Miscellaneous	508	121	4												633	3
Total Persons	14,566	4,372	561	167	42	24	12	4	0	1	0	0	0	0	19,749	
Total Person-rem	0	118	85	58	24	21	14	7	0	3	0	0	0	0	330	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.195
Distribution of Shallow Dose by Occupation and Dose Range^(a)
1990 - Unknown

Occupation	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)																	Total Persons	Total Person-rem
	< Meas.	Meas. - <0.10	0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1.0- 1.5	1.5- 2.0	2.0- 2.5	2.5- 3.0	3.0- 3.5	3.5- 4.0	4.0- 4.5	4.5- 5.0	≥ 5				
Unknown	611	1,484	100	23	22	10	13	9	7	3	1			1	3	2,287	160		
Scientists	18	7														25			
Technicians	3	1														4			
Service	14	13														27			
Construction	437	143	2													582	2		
Laborers	1	1														2			
Miscellaneous	153	139	2													294	3		
Total Persons	1,237	1,788	104	23	22	10	13	9	7	3	1	0	0	1	3	3,221			
Total Person-rem	0	38	15	8	14	8	17	16	16	8	3	0	0	5	17		165		

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.196
Distribution of Collective Shallow Dose by Occupation and Dose Range^(a)
1990 - Male

Occupation	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem				
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0		4.0-4.5	4.5-5.0	≥ 5	
Unknown	64	38	41	22	11	28	20	16	27	4	4	4	273	12,969		
Management	58	30	18	6	5	3	2						126	8,267		
Scientists	162	65	54	26	14	32	22	11	3	3			406	25,927		
Technicians	90	109	113	62	36	68	25	13	3			5	525	9,469		
Service	46	11	6	3	1		5		3				75	5,833		
Agriculture														109		
Construction	156	124	114	66	54	67	44	9	11	12			656	13,084		
Production	95	144	145	83	49	51	23			4			594	7,101		
Transportation	18	7	5	3	3	6	5						47	2,130		
Laborers	22	27	32	13	14	9		2					119	1,724		
Miscellaneous	16	5	10	3	1	1							36	3,439		
Total Person-rem	0	727	560	537	287	188	264	145	52	46	15	8	4	5	21	2,859
Total Persons	58,076	25,745	3,639	1,542	475	217	218	88	23	17	5	2	1	1	3	90,052

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.197
Distribution of Collective Shallow Dose by Occupation and Dose Range^(a)
1990 - Female

Occupation	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem			
	< Meas.	0.10- <0.10	0.25- 0.25	0.50- 0.50	0.75- 1.00	1.0- 1.5	1.5- 2.0	2.0- 2.5	2.5- 3.0	3.0- 3.5	3.5- 4.0		4.0- 4.5	4.5- 5.0	≥ 5
Unknown	7	5	6	2	3	2	2							25	2,988
Management	14	6	2	2										23	4,823
Scientists	23	9	7	2	1	2								44	4,451
Technicians	23	23	21	9	5	5	5							90	2,425
Service	14	3	2	1	1									20	1,688
Agriculture															13
Construction	11	7	2	2	2	1		3						28	962
Production	18	28	16	6	9	5								81	1,301
Transportation	1													2	102
Laborers	5	4	3	1	2									14	363
Miscellaneous	2	1												3	633
Total Person-rem	0	118	85	58	24	21	14	7	0	3	0	0	0	0	330
Total Persons	14,566	4,372	561	167	42	24	12	4	0	1	0	0	0	0	19,749

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.198
Distribution of Collective Shallow Dose by Occupation and Dose Range^(a)
1990 - Unknown Sex

Occupation	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem				
	< Meas.	Meas. - <0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50		3.50-4.00	4.00-4.50	4.50-5.00	≥ 5
Unknown		33	14	8	14	8	17	16	16	8	3		5	17	160	2,287
Scientists																25
Technicians																4
Service																27
Construction		2													2	582
Laborers																2
Miscellaneous		3													3	294
Total Person-rem	0	38	15	8	14	8	17	16	16	8	3	0	0	5	17	165
Total Persons	1,237	1,788	104	23	22	10	13	9	7	3	1	0	0	1	3	3,221

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.199
Distribution of Persons Receiving Shallow Dose by Age and Facility Type^(a)
1990 - Male

Facility Type	Number of Persons Receiving Radiation Doses in Each Age Range													Total Persons	Total Person-rem
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65	Unknown			
Accelerator	30	-	240	811	750	734	610	569	431	233	108	178	5,306	114	
Fuel/Uran. Enrichment	14	104	299	568	1,014	1,017	642	471	396	408	99	87	5,119	99	
Fuel Fabrication	12	170	385	516	471	371	275	217	208	134	42		2,801	76	
Fuel Processing	1	175	411	583	535	514	291	212	190	155	25		3,092	391	
Maint. and Support	85	1,011	2,446	3,443	3,617	3,313	2,454	2,091	1,764	1,108	386	218	21,936	566	
Reactor	3	204	829	980	996	856	563	472	386	262	39	21	5,611	402	
Research, General	98	644	1,193	1,973	2,275	2,042	1,768	1,513	1,390	976	518	344	14,734	332	
Research, Fusion	1	28	76	134	152	153	140	126	96	79	50	37	1,072	7	
Waste Proc./Management	11	193	579	803	760	681	471	407	266	157	53	23	4,404	143	
Weapons Fab. & Test.	18	285	963	1,994	2,224	2,350	1,937	1,677	1,444	896	235	211	14,234	457	
Other	49	540	1,479	1,932	1,858	1,737	1,267	931	739	513	265	433	11,743	272	
Total Persons	322	3,594	9,272	13,737	14,652	13,768	10,418	8,686	7,310	4,921	1,820	1,552	90,052		
Total Person-rem	3	94	366	550	565	422	295	225	197	99	19	22		2,859	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.200
Distribution of Persons Receiving Shallow Dose by Age and Facility Type^(a)
1990 - Female

Facility Type	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown
Accelerator	17	57	107	120	100	83	48	39	19	10	6	17	623	9
Fuel/Uran. Enrichment	9	82	134	205	252	167	114	86	78	41	12	16	1,196	17
Fuel Fabrication	2	54	109	131	111	109	40	37	23	18	3		637	14
Fuel Processing	2	80	120	190	135	101	69	38	14	7	4		760	39
Maint. and Support	37	383	803	967	900	795	575	348	235	119	32	47	5,241	76
Reactor	2	66	131	146	104	80	38	20	15	10	2	5	619	18
Research, General	65	274	429	617	578	559	302	226	154	83	46	80	3,213	39
Research, Fusion		5	7	15	13	20	14	5	6	4	3	3	95	
Waste Proc./Management	4	95	202	187	198	145	102	58	26	22	5	2	1,046	20
Weapons Fab. & Test.	18	150	363	606	636	609	390	317	198	104	30	14	3,435	65
Other	29	352	525	528	480	363	226	159	94	44	27	57	2,884	32
Total Persons	185	1,598	2,930	3,712	3,507	2,831	1,918	1,333	862	462	170	241	19,749	
Total Person-rem	0	26	51	76	62	50	27	22	7	7	1	1	330	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.201
Distribution of Persons Receiving Shallow Dose by Age and Facility Type^(a)
1990 - Unknown Sex

Facility Type	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem		
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown	
Accelerator			1	1						1			15	18	
Fuel/Uran. Enrichment					1								31	32	1
Maint. and Support		1		1									583	585	2
Research, General	13	8	8	1					1	1			145	177	2
Weapons Fab. & Test.	1	2	2	6	3	2	3	2	2	1			872	896	20
Other			3	5	3	6	1	2	3	1	78	1,411	1,513	139	
Total Persons	14	11	14	14	7	8	4	4	6	4	78	3,057	3,221		
Total Person-rem	0	0	0	0	0	0	0	0	0	0	2	162	1,513	139	165

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.202
Distribution of Collective Shallow Dose by Age and Facility Type^(a)
1990 - Male

Facility Type	Collective Dose Equivalent in Each Age Range											Total Person-rem		
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65		Unknown	
Accelerator		5	12	19	22	18	13	9	11	3	1	1	114	5,306
Fuel/Uran. Enrichment		1	7	15	20	21	11	8	8	6	1		99	5,119
Fuel Fabrication		3	11	15	14	7	8	3	9	7			76	2,801
Fuel Processing		18	79	107	-	73	53	28	16	11	6		391	3,092
Maint. and Support	2	37	89	117	105	87	53	36	27	11	1	1	566	21,936
Reactor		8	53	69	89	59	48	35	22	16		1	402	5,611
Research, General		6	28	50	79	44	27	34	42	14	7	2	332	14,734
Research, Fusion			1	2	1	1	1	1	1	1			7	1,072
Waste Proc./Management		7	29	37	26	18	11	5	6	4			143	4,404
Weapons Fab. & Test.		2	27	66	77	83	68	54	50	24	4	2	457	14,234
Other		6	32	54	59	31	27	25	12	8	4	14	272	11,743
Total Person-rem	3	94	366	550	565	422	295	225	197	99	19	22	2,859	
Total Persons	322	3,594	9,272	13,737	14,652	13,768	10,418	8,686	7,310	4,921	1,820	1,552	90,052	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.203
Distribution of Collective Shallow Dose by Age and Facility Type^(a)
1990 - Female

Facility Type	Collective Dose Equivalent in Each Age Range											Total Person-rem		
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65		Unknown	
Accelerator	1	1	1	1	1	4	1						9	623
Fuel/Uran. Enrichment	1	1	1	4	4	3	1	1	1	1			17	1,196
Fuel Fabrication			1	4	2	5							14	637
Fuel Processing	6	5	5	14	9	3	2						39	760
Maint. and Support	8	18	18	21	12	9	4	2	1	1			76	5,241
Reactor	1	2	2	5	5	4	1						18	619
Research, General	1	6	6	10	6	3	4	5	2	1			39	3,213
Research, Fusion														95
Waste Proc./Management	2	4	4	3	5	1	3	2					20	1,046
Weapons Fab. & Test.	2	5	5	9	14	14	8	7	2	4			65	3,435
Other	5	7	7	5	4	4	2	4					32	2,884
Total Person-rem	0	26	51	76	62	50	27	22	7	7	1	1	330	
Total Persons	185	1,598	2,930	3,712	3,507	2,831	1,918	1,333	862	462	170	241	19,749	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.204
Distribution of Collective Shallow Dose by Age and Facility Type^(a)
1990 - Unknown Sex

Facility Type	Collective Dose Equivalent in Each Age Range											Total Person-rem	Total Persons				
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown			
Accelerator																18	
Fuel/Uran. Enrichment															1	1	32
Maint. and Support															2	2	585
Research, General															2	2	177
Weapons Fab. & Test.															19	20	896
Other														2	137	139	1,513
Total Person-rem	0	0	0	0	0	0	0	0	0	0	0	0	0	2	162	165	
Total Persons	14	11	14	14	7	8	4	4	4	6	4	78	3,057			3,221	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.205
Distribution of Persons Receiving Shallow Dose by Age and Occupation^(a)
1990 - Male

Occupation	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown
Unknown	121	591	1,084	1,791	1,704	1,782	1,677	1,519	1,133	721	414	432	12,969	273
Management	15	92	356	853	1,367	1,547	1,261	1,122	888	569	150	47	8,267	126
Scientists	18	870	2,740	3,974	4,150	3,918	3,007	2,583	2,309	1,520	618	220	25,927	406
Technicians	20	433	1,176	1,736	1,712	1,391	876	710	685	442	102	186	9,469	525
Service	22	301	1,041	1,224	901	746	473	362	272	190	123	178	5,833	75
Agriculture		8	11	21	16	18	4	10	11	3	2	5	109	
Construction	59	718	1,390	1,904	2,194	2,180	1,529	1,209	932	689	150	130	13,084	656
Production	10	207	745	1,119	1,394	1,134	831	562	552	432	97	18	7,101	594
Transportation	3	44	165	334	403	370	245	211	202	107	23	23	2,130	47
Laborers	16	95	231	326	317	258	155	113	98	58	11	46	1,724	119
Miscellaneous	38	235	333	455	494	424	360	285	228	190	130	267	3,439	36
Total Persons	322	3,594	9,272	13,737	14,652	13,768	10,418	8,686	7,310	4,921	1,820	1,552	90,052	
Total Person-rem	3	94	366	550	565	422	295	225	197	99	19	22	2,859	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

**TABLE D.206
Distribution of Persons Receiving Shallow Dose by Age and Occupation^(a)
1990 - Female**

Occupation	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown
Unknown	69	269	372	455	450	424	340	263	159	80	50	57	2,988	25
Management	22	299	541	739	805	837	618	464	310	126	42	20	4,823	23
Scientists	5	354	886	1,010	838	526	349	212	143	82	30	16	4,451	44
Technicians	20	201	378	547	493	365	165	114	68	47	7	20	2,425	90
Service	12	175	240	330	297	207	147	102	64	57	18	39	1,688	20
Agriculture		1	2	1	3	4		2					13	
Construction	11	115	203	193	175	114	66	32	26	20	1	6	962	28
Production	5	64	153	261	272	220	150	77	59	32	7	1	1,301	81
Transportation		2	15	22	21	15	14	5	3	3	2		102	2
Laborers	12	20	46	61	65	63	40	38	8	5		5	363	14
Miscellaneous	29	98	94	93	88	56	29	24	22	10	13	77	633	3
Total Persons	185	1,598	2,930	3,712	3,507	2,831	1,918	1,333	862	462	170	241	19,749	
Total Person-rem	0	26	51	76	62	50	27	22	7	7	1	1	330	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.207
Distribution of Persons Receiving Shallow Dose by Age and Occupation^(a)
1990 - Unknown Sex

Occupation	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown
Unknown	1	2	6	12	6	8	4	4	5	2	78	2,159	2,287	160
Scientists				2								23	25	
Technicians												4	4	
Service												27	27	
Construction		1		1						1		579	582	2
Laborers												2	2	
Miscellaneous	13	8	6	1	1				1	1		263	294	3
Total Persons	14	11	14	14	7	8	4	4	6	4	78	3,057	3,221	
Total Person-rem	0	0	0	0	0	0	0	0	0	0	2	162		165

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.208
Distribution of Collective Shallow Dose by Age and Occupation^(a)
1990 - Male

Occupation	Collective Dose Equivalent in Each Age Range											Total Person-rem		
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65		Unknown	
Unknown	1	3	18	41	62	36	31	32	20	10	4	14	273	12,969
Management		1	8	25	25	23	14	13	9	7	1		126	8,267
Scientists		10	59	71	74	61	36	30	38	20	7	2	406	25,927
Technicians		18	80	127	113	63	42	29	34	15	1	2	525	9,469
Service		2	12	18	11	12	5	4	5	4	1	1	75	5,833
Agriculture													109	
Construction	1	36	87	116	122	100	75	60	41	17	2		656	13,084
Production		16	79	108	118	94	71	44	38	23	3		594	7,101
Transportation		2	4	9	12	8	6	2	3	1			47	2,130
Laborers		4	18	29	23	19	12	8	5	1			119	1,724
Miscellaneous		1	2	6	5	5	4	4	5	2	1	1	36	3,439
Total Person-rem	3	94	366	550	565	422	295	225	197	99	19	22	2,859	
Total Persons	322	3,594	9,272	13,737	14,652	13,768	10,418	8,686	7,310	4,921	1,820	1,552	90,052	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.209
Distribution of Collective Shallow Dose by Age and Occupation^(a)
1990 - Female

Occupation	Collective Dose Equivalent in Each Age Range													Total Person-rem
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65	Unknown		
Unknown		1	4	3	4	4	2	4	1	1			25	2,988
Management		2	3	4	3	5	2	3	1	1			23	4,823
Scientists		5	8	12	7	5	4	2	1	1			44	4,451
Technicians		8	15	26	16	12	5	4	1	3			90	2,425
Service		3	3	4	3	1	2	3	1				20	1,688
Agriculture														13
Construction		3	7	6	5	5	1	1					28	962
Production		4	9	17	20	14	10	5	2	1			81	1,301
Transportation					1								2	102
Laborers			1	3	4	3	1	1					14	363
Miscellaneous				1									3	633
Total Person-rem	0	26	51	76	62	50	27	22	7	7	1	1	330	
Total Persons	185	1,598	2,930	3,712	3,507	2,831	1,918	1,333	862	462	170	241	19,749	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.210
Distribution of Collective Shallow Dose by Age and Occupation^(a)
1990 - Unknown Sex

Occupation	Collective Dose Equivalent in Each Age Range											Total Person-rem	Total Persons		
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown	
Unknown												2	157	160	2,287
Scientists															25
Technicians															4
Service															27
Construction													2	2	582
Laborers															2
Miscellaneous													3	3	294
Total Person-rem	0	0	0	0	0	0	0	0	0	0	0	2	162	165	
Total Persons	14	11	14	14	7	8	4	4	4	4	78	3,057			3,221

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.211
Distribution of Persons Receiving Shallow Dose by Occupation and Facility Type^(a)
1990 - Male

Facility Type	Number of Persons Receiving Radiation Doses in Each Occupation											Total Persons rem	
	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer	Misc.		
Accelerator	1,164	131	2,021	1,402	122	17	139	100	34	1	175	5,306	114
Fuel/Uran. Enrichment	244	790	1,146	512	343	1	1,019	782	46	177	59	5,119	99
Fuel Fabrication	33	254	835	238	135		904	256	41	85	20	2,801	76
Fuel Processing	8	334	1,340	190	43	-	472	611	42	23	28	3,092	391
Maint. and Support	4,412	1,939	3,045	1,277	1,311	25	7,179	1,147	723	829	49	21,936	566
Reactor	21	753	2,285	545	130		640	712	85	61	379	5,611	402
Research, General	2,959	917	5,651	1,904	549	9	505	346	57	110	1,727	14,734	332
Research, Fusion	115	77	443	216	48		104	32		1	36	1,072	7
Waste Proc./Management	109	563	1,434	655	174		733	482	160	55	39	4,404	143
Weapons Fab. & Test.	2,082	1,690	3,731	1,741	840		1,037	2,367	405	242	99	14,234	457
Other	1,822	819	3,996	789	2,138	56	352	266	537	140	828	11,743	272
Total Persons	12,969	8,267	25,927	9,469	5,833	109	13,084	7,101	2,130	1,724	3,439	90,052	
Total Person-rem	273	126	406	525	75	0	656	594	47	119	36	2,859	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.212
Distribution of Persons Receiving Shallow Dose by Occupation and Facility Type^(a)
1990 - Female

Facility Type	Number of Persons Receiving Radiation Doses in Each Occupation											Total Persons-rem
	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer	Misc.	
Accelerator	169	71	226	101	41	4	4	4	4	7	623	9
Fuel/Uran. Enrichment	71	464	217	169	81	43	97	33	3	18	1,196	17
Fuel Fabrication	8	154	214	88	23	41	85	19	3	2	637	14
Fuel Processing	1	186	240	57	29	45	197	1	3	1	760	39
Maint. and Support	1,107	1,491	705	620	272	640	140	205	46	15	5,241	76
Reactor	3	163	171	63	21	36	131	4	2	25	619	18
Research, General	775	502	862	536	113	16	36	17	1	353	3,213	39
Research, Fusion	12	29	29	15	6	2				2	95	
Waste Proc./Management	19	228	208	195	195	35	139	4	14	9	1,046	20
Weapons Fab. & Test.	510	1,020	750	380	147	97	440	55	10	26	3,435	65
Other	313	515	829	201	760	11	32	25	20	175	2,884	32
Total Persons	2,988	4,823	4,451	2,425	1,688	13	962	1,301	102	633	19,749	
Total Person-rem	25	23	44	90	20	0	28	81	2	14	3	330

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.213
Distribution of Persons Receiving Shallow Dose by Occupation and Facility Type^(a)
1990 - Unknown Sex

Facility Type	Number of Persons Receiving Radiation Doses in Each Occupation										Total Person-rem	
	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer		Misc.
Accelerator	2		11	3	1		1					18
Fuel/Uran. Enrichment	32											32
Maint. and Support					3	581			1			585
Research, General	6		12		1						158	177
Weapons Fab. & Test.	872			22					1		1	896
Other	1,375		2		1						135	1,513
Total Persons	2,287	0	25	4	27	0	582	0	0	2	294	3,221
Total Person-rem	160	0	0	0	0	0	2	0	0	0	3	165

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.214
Distribution of Collective Shallow Dose by Occupation and Facility Type^(a)
1990 - Male

Facility Type	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Occupation	Production	Transport	Laborer	Misc.	Person-rem	Total Persons
Accelerator	43	1	20	45	1	1	1	2	1	114	1	1	114	5,306
Fuel/Uran. Enrichment	2	11	9	7	10	23	23	1	11	99	1	1	99	5,119
Fuel Fabrication		4	10	12	13	8	26	2	1	76	1		76	2,801
Fuel Processing	1	13	71	45	2	124	121	10	5	391	5		391	3,092
Maint. and Support	10	19	28	87	10	294	37	15	66	566			566	21,936
Reactor	1	25	71	86	2	108	91	1	13	402	5		402	5,611
Research, General	57	10	89	108	6	25	14	3	13	332	7		332	14,734
Research, Fusion			2	2	1	1	1			7			7	1,072
Waste Proc./Management	5	5	28	20	3	29	42	10		143			143	4,404
Weapons Fab. & Test.	35	35	39	60	7	29	229	2	9	457	14		457	14,234
Other	120	4	39	54	21	14	10	1	1	272	7		272	11,743
Total Person-rem	273	126	406	525	75	0	656	47	119	2,859	36		2,859	
Total Persons	12,969	8,267	25,927	9,469	5,833	109	13,084	7,101	2,130	1,724	3,439		90,052	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.215
Distribution of Collective Shallow Dose by Occupation and Facility Type^(a)
1990 - Female

Facility Type	Collective Dose-Equivalent in Each Occupation											Total Person-rem	Total Persons	
	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer	Misc.			
Accelerator	5		1	3									9	623
Fuel/Uran. Enrichment		4	2	2	2	1	4	2					17	1,196
Fuel Fabrication		1	1	1			10						14	637
Fuel Processing			7	7		1	23						39	760
Maint. and Support	1	6	5	32	1	17	5	1	7				76	5,241
Reactor		1	3	6		1	6		1				18	619
Research, General	12	1	7	15	1	1	1		1				39	3,213
Research, Fusion														95
Waste Proc./Management		1	2	5	3	1	8						20	1,046
Weapons Fab. & Test.	5	8	9	11	1	5	23		3				65	3,435
Other	1	1	6	9	11	1	2						32	2,884
Total Person-rem	25	23	44	90	20	0	81	2	14	3	330			
Total Persons	2,988	4,823	4,451	2,425	1,688	13	962	1,301	102	363	633		19,749	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.216
Distribution of Collective Shallow Dose by Occupation and Facility Type^(a)
1990 - Unknown Sex

Facility Type	Collective Dose-Equivalent in Each Occupation											Total Person-rem												
	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer	Misc.													
Accelerator																							18	
Fuel/Uran. Enrichment																							1	32
Maint. and Support																							2	585
Research, General																							2	177
Weapons Fab. & Test.	20																						20	896
Other	139																						139	1,513
Total Person-rem	160	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	165	
Total Persons	2,287	0	25	4	27	0	582	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,221	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.217
Distribution of Arm and Hand Dose by Facility Type and Dose Range^(a)
1990 - Male

Facility Type	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem				
	< Meas.	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50			3.50-4.00	4.00-4.50	4.50-5.00	≥ 5
Accelerator	4,932	251	70	42	6	3	1						1			5,306	46
Fuel/Uran. Enrichment	4,709	355	36	15	1			2						1		5,119	35
Fuel Fabrication	2,743	35	13	4	1	2	1		1						1	2,801	15
Fuel Processing	2,742	121	77	63	36	29	19	3	2							3,092	119
Maint. and Support	20,297	1,217	181	112	48	21	37	10	5	1	1				6	21,936	272
Reactor	5,005	361	96	60	27	14	8	15	6	8	9	1			1	5,611	185
Research, General	13,378	902	193	120	29	14	27	19	11	6	8	7	3	2	15	14,734	453
Research, Fusion	1,065	6		1												1,072	1
Waste Proc./Management	3,129	847	217	120	48	19	16	3	2	1	1	1				4,404	185
Weapons Fab. & Test.	9,890	3,056	683	335	128	62	45	19	7	1	1		1		6	14,234	613
Other	11,220	358	57	39	18	14	21	10	5		1					11,743	113
Total Persons	79,110	7,509	1,623	911	342	178	175	79	40	18	21	10	5	3	28	90,052	
Total Person-rem	0	241	251	317	206	154	213	134	90	49	68	37	21	14	243		2,036

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.218
Distribution of Arm and Hand Dose by Facility Type and Dose Range^(a)
1990 - Female

Facility Type	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem				
	< Meas.	0.10- <0.10	0.25- 0.10	0.50- 0.25	0.75- 0.50	1.00- 0.75	1.5- 1.00	2.0- 1.5	2.5- 2.0	3.0- 2.5	3.5- 3.0			4.0- 3.5	4.5- 4.0	5.0- 4.5	≥ 5
Accelerator	600	19	3	1												623	2
Fuel/Uran. Enrichment	1,132	61	3													1,196	3
Fuel Fabrication	623	10	1	1	2											637	2
Fuel Processing	686	22	15	9	16	6	6									760	29
Maint. and Support	4,951	208	40	21	6	5	7	2	1							5,241	41
Reactor	578	28	6	3		1	2					1				619	9
Research, General	2,959	174	32	16	12	4	8	2	1	2	1					3,213	79
Research, Fusion	95															95	
Waste Proc./Management	748	217	42	25	5	5	1	2	1							1,046	36
Weapons Fab. & Test.	2,644	596	120	36	16	6	11	2	2	1			1			3,435	91
Other	2,805	44	14	8	3	1	7	1				1				2,884	23
Total Persons	17,821	1,379	276	119	61	28	42	9	5	3	1	2	1	0	2	19,749	
Total Person-rem	0	44	43	42	38	24	48	15	11	8	3	7	4	0	28		315

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.219
Distribution of Arm and Hand Dose by Facility Type and Dose Range^(a)
1990 - Unknown Sex

Facility Type	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Person-rem			
	< Meas.	0.10- <0.10	0.25- 0.10-0.25	0.50- 0.25-0.50	0.75- 0.50-0.75	1.0- 0.75-1.0	1.5- 1.0-1.5	2.0- 1.5-2.0	2.5- 2.0-2.5	3.0- 2.5-3.0	3.5- 3.0-3.5		4.0- 3.5-4.0	4.5- 4.0-4.5	5.0- 4.5-5.0
Accelerator															18
Fuel/Uran. Enrichment	5														32
Maint. and Support	585														585
Research, General	171														177
Weapons Fab. & Test.	828	61	5	1										1	896
Other	922	500	65	19	3	2	2	2	2	2	2	2	2		1,513
Total Persons	2,529	594	70	20	3	2	2	0	0	0	0	0	0	0	3,221
Total Person-rem	0	18	9	7	2	2	2	0	0	0	0	0	0	5	46

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.220
Distribution of Collective Arm and Hand Dose by Facility Type and Dose Range^(a)
1990 - Male

Facility Type	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem				
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50	3.50-4.00		4.00-4.50	4.50-5.00	≥ 5.00	
Accelerator	9	10	15	3	3	1							5		46	5,306
Fuel/Uran. Enrichment	16	5	5	1		5						4			35	5,119
Fuel Fabrication	1	2	1	1	2	1		3		4					15	2,801
Fuel Processing	6	12	21	22	26	22	5	-	4						119	3,092
Maint. and Support	32	28	39	29	18	44	17	11	3	3				47	272	21,936
Reactor	11	15	21	16	12	10	25	14	22	29	4			7	185	5,611
Research, General	29	30	41	18	12	34	33	25	17	27	26	12	9	142	453	14,734
Research, Fusion															1	1,072
Waste Proc./Management	25	33	41	29	17	20	5	5	3	3	4				185	4,404
Weapons Fab. & Test.	101	106	119	76	52	55	31	16	3	3	4		47		613	14,234
Other	10	9	14	11	12	26	17	11		3					113	11,743
Total Person-rem	0	241	251	317	206	154	213	134	90	49	68	37	21	14	243	2,036
Total Persons	79,110	7,509	1,623	911	342	178	175	79	40	18	21	10	5	3	28	90,052

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.221
Distribution of Collective Arm and Hand Dose by Facility Type and Dose Range^(a)
1990 - Female

Facility Type	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem					
	< Meas.	0.10- <0.10	0.25- 0.25	0.50- 0.50	0.75- 0.75	1.00- 1.00	1.5- 1.5	2.0- 2.0	2.5- 2.5	3.0- 3.0	3.5- 3.5		4.0- 4.0	4.5- 4.5	5.0- 5.0	≥ 5	
Accelerator	1				1											2	623
Fuel/Uran. Enrichment	3															3	1,196
Fuel Fabrication	1				1											2	637
Fuel Processing	1	2	4	4	10	5	7									29	760
Maint. and Support	7	6	7	3	4	8	3	2								41	5,241
Reactor	1	1	1		1	2				4						9	619
Research, General	5	5	5	8	3	10	4	2	6	3					28	79	3,213
Research, Fusion																	95
Waste Proc./Management	7	6	9	3	4	1	3	2								36	1,046
Weapons Fab. & Test.	18	18	13	10	5	12	4	4	3		4					91	3,435
Other	1	3	3	2	1	8	2				4					23	2,884
Total Person-rem	0	44	43	42	38	24	48	15	11	8	3	7	4	0	28	315	
Total Persons	17,821	1,379	276	119	61	28	42	9	5	3	1	2	1	0	2		19,749

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.222
Distribution of Collective Arm and Hand Dose by Facility Type and Dose Range^(a)
1990 - Unknown Sex

Facility Type	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem	Total Persons			
	< Meas.	Meas.- <0.10	0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1.00- 1.5	1.5- 2.0	2.0- 2.5	2.5- 3.0	3.0- 3.5			3.5- 4.0	4.0- 4.5	4.5- 5.0
Accelerator																18
Fuel/Uran. Enrichment															1	32
Maint. and Support																585
Research, General																177
Weapons Fab. & Test.															5	896
Other															35	1,513
Total Person-rem	0	18	9	7	2	2	2	2	0	0	0	0	0	0	5	46
Total Persons	2,529	594	70	20	3	2	2	2	0	0	0	0	0	0	1	3,221

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.223
Distribution of Arm and Hand Dose by Age and Dose Range^(a)
1990 - Male

Age Range	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)																Total Persons	Total Person-rem
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50	3.50-4.00	4.00-4.50	4.50-5.00	≥ 5.00				
19 and less	308	11	2	1												322	1	
20 - 24	3,367	167	23	20	7	4	5	1								3,594	32	
25 - 29	8,244	629	177	118	41	24	21	8	2	3	2	1			2	9,272	210	
30 - 34	11,954	1,140	304	162	66	38	40	14	5	2	2	6	1		3	13,737	359	
35 - 39	12,673	1,332	307	164	61	38	31	22	7	5	2	3	2		5	14,652	392	
40 - 44	11,955	1,279	238	144	55	32	33	12	7	2	4	2			5	13,768	327	
45 - 49	9,098	931	184	109	38	16	17	3	8	2	5		1		6	10,418	275	
50 - 54	7,580	808	150	77	31	8	12	10	4		3				3	8,686	179	
55 - 59	6,381	643	147	75	23	13	10	6	5	3		1	1		2	7,310	159	
60 - 64	4,378	398	74	33	20	4	4	3	2	1	2				2	4,921	88	
65 and greater	1,662	132	15	8	1	1	1	.1								1,820	12	
Unknown	1,510	39	2				1									1,552	3	
Total Persons	79,110	7,509	1,623	911	342	178	175	79	40	18	21	10	5	3	28	90,052		
Total Person-rem	0	241	251	317	206	154	213	134	90	49	68	37	21	14	243	2,036		

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.224
Distribution of Arm and Hand Dose by Age and Dose Range^(a)
1990 - Female

Age Range	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem				
	< Meas.	Meas. - <0.10	0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1.00- 1.5	1.5- 2.0	2.0- 2.5	2.5- 3.0	3.0- 3.5			3.5- 4.0	4.0- 4.5	4.5- 5.0	≥ 5
19 and less	173	12														185	
20 - 24	1,473	85	26	6	2	4	1	1								1,598	16
25 - 29	2,656	194	42	22	10	3	2	1								2,930	34
30 - 34	3,338	260	56	18	18	5	11	2	1	1	1				1	3,712	85
35 - 39	3,138	253	54	27	12	6	13	1	1			2				3,507	64
40 - 44	2,549	203	36	23	10	2	6	1	1	1						2,831	40
45 - 49	1,711	149	28	15	3	3	5	4								1,918	32
50 - 54	1,192	108	16	4	6	3	3	3				1				1,333	21
55 - 59	787	61	8	2	2	2		1						1		862	13
60 - 64	409	40	9	1			1	1	1	1						462	9
65 and greater	157	12	1													170	
Unknown	238	2		1												241	
Total Persons	17,821	1,379	276	119	61	28	42	9	5	3	1	2	1	0	2	19,749	
Total Person-rem	0	44	43	42	38	24	48	15	11	8	3	7	4	0	28	315	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.225
Distribution of Arm and Hand Dose by Age and Dose Range^(a)
1990 - Unknown Sex

Age Range	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem				
	< Meas.	<0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50			3.50-4.00	4.00-4.50	4.50-5.00	≥ 5.00
19 and less	13	1														14	
20 - 24	11															11	
25 - 29	13	1														14	
30 - 34	13	1														14	
35 - 39	6		1													7	
40 - 44	8															8	
45 - 49	1	3														4	
50 - 54	2	2														4	
55 - 59	5	1														6	
60 - 64	4															4	
65 and greater	47	21	9	1												78	2
Unknown	2,406	564	60	19	3	2	2								1	3,057	43
Total Persons	2,529	594	70	20	3	2	2	0	0	0	0	0	0	0	1	3,221	
Total Person-rem	0	18	9	7	2	2	2	0	0	0	0	0	0	0	5		46

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.226
Distribution of Collective Arm and Hand Dose by Age and Dose Range^(a)
1990 - Male

Age Range	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem					
	< 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50	3.50-4.00		4.00-4.50	4.50-5.00	≥ 5		
19 and less															1	322	
20 - 24	4	4	-	7	4	4	6				3					32	3,594
25 - 29	20	28	40	40	24	20	25	14	4	8	7	4		16		210	9,272
30 - 34	37	47	56	56	39	33	48	23	11	6	6	22	5	26		359	13,737
35 - 39	43	47	58	58	37	33	38	38	16	14	6	11	8	42		392	14,652
40 - 44	42	38	50	50	33	27	40	20	15	5	13	8	8	35		327	13,768
45 - 49	30	28	36	36	23	14	21	5	19	5	16		5	71		275	10,418
50 - 54	25	22	28	28	19	7	15	18	9		9			27		179	8,686
55 - 59	21	22	27	27	14	11	12	10	11	8		4	5	14		159	7,310
60 - 64	13	11	12	12	12	4	5	5	5	3	6			12		88	4,921
65 and greater	4	2	2	2	1	1	1	2								12	1,820
Unknown	1						1									3	1,552
Total Person-rem	0	241	251	317	206	154	213	134	90	49	68	37	21	14	243	2,036	
Total Persons	79,110	7,509	1,623	911	342	178	175	79	40	18	21	10	5	3	28	90,052	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.227
Distribution of Collective Arm and Hand Dose by Age and Dose Range^(a)
1990 - Female

Age Range	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem					
	< Meas.	Meas. - <0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50		3.50-4.00	4.00-4.50	4.50-5.00	≥ 5	
19 and less																185	
20 - 24		2	4	2	1	3	-1	2								16	1,598
25 - 29		7	7	7	6	3	2	2								34	2,930
30 - 34		8	9	7	11	4	13	3	2	3	3			22	85	3,712	
35 - 39		-	8	10	7	5	15	2	2		7				64	3,507	
40 - 44		7	6	8	6	2	7	2	2	3					40	2,831	
45 - 49		5	4	6	2	3	6	7							32	1,918	
50 - 54		3	2	1	4	3	4					4			21	1,333	
55 - 59		2	1	1	2	2		2					6	13	862		
60 - 64		1	2			1		2	2	3				9	462		
65 and greater															170		
Unknown															241		
Total Person-rem	0	44	43	42	38	24	48	15	11	8	3	7	4	0	28	315	
Total Persons	17,821	1,379	276	119	61	28	42	9	5	3	1	2	1	0	2	19,749	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.228
Distribution of Collective Arm and Hand Dose by Age and Dose Range^(a)
1990 - Unknown Sex

Age Range	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem	Total Persons				
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50	3.50-4.00			4.00-4.50	4.50-5.00	≥ 5.00	
19 and less																	14
20 - 24																	11
25 - 29																	14
30 - 34																	14
35 - 39																	7
40 - 44																	8
45 - 49																	4
50 - 54																	4
55 - 59																	6
60 - 64																	4
65 and greater	1																2
Unknown	16	8	7	2	2	2	2	2	2	2	2	2	2	2	2	5	43
Total Person-rem	0	18	9	7	2	2	2	2	2	2	2	2	2	2	2	0	46
Total Persons	2,529	594	70	20	3	2	2	2	2	2	2	2	2	2	2	1	3,221

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.229
Distribution of Arm and Hand Dose by Occupation and Dose Range^(a)
1990 - Male

Occupation	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)																	Total Persons	Total Person-rem
	< Meas.	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0	4.0-4.5	4.5-5.0	≥ 5				
Unknown	12,266	616	55	26	3	1		2									12,969	39	
Management	6,944	1,116	141	40	13	7	4		1				1				8,267	90	
Scientists	23,943	1,569	229	88	29	11	17	14	6	3	5	1		1		11	25,927	312	
Technicians	7,456	1,164	385	228	74	43	51	24	15	6	6	6	2	2		7	9,469	553	
Service	5,314	484	23	9	2		1										5,833	21	
Agriculture																	109		
Construction	11,443	1,109	254	136	55	19	26	17	9	5	5	2	2			2	13,084	324	
Production	4,804	1,132	479	331	154	86	69	23	7	3	5					8	7,101	626	
Transportation	1,919	175	14	14	3	4		1									2,130	20	
Laborers	1,540	114	32	21	4	6	6					1					1,724	36	
Miscellaneous	3,372	30	11	18	5	1	1	1									3,439	17	
Total Persons	79,110	7,509	1,623	911	342	178	175	79	40	18	21	10	5	3	28		90,052		
Total Person-rem	0	241	251	317	206	154	213	134	90	49	68	37	21	14	243		2,036		

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.230
Distribution of Arm and Hand Dose by Occupation and Dose Range^(a)
1990 - Female

Occupation	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons-rem				
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0		4.0-4.5	4.5-5.0	5.0-rem	
Unknown	2,864	105	11	6	2										2,988	8
Management	4,463	314	30	12	1	1	2								4,823	19
Scientists	4,119	259	39	17	7	2	4	1	2						4,451	44
Technicians	1,882	328	114	38	24	9	17	5	4	-	1	1	1	1	2,425	136
Service	1,603	84	1												1,688	2
Agriculture															13	
Construction	899	50	6	2	2	1	1	1	1						962	9
Production	934	196	70	39	25	15	18	3	1						1,301	89
Transportation	100	1		1											102	
Laborers	324	31	3	4									1		363	7
Miscellaneous	620	11	2												633	1
Total Persons	17,821	1,379	276	119	61	28	42	9	5	3	1	2	1	0	2	19,749
Total Person-rem	0	44	43	42	38	24	48	15	11	8	3	7	4	0	28	315

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.231
Distribution of Arm and Hand Dose by Occupation and Dose Range^(a)
1990 - Unknown

Occupation	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem				
	< Meas.	Meas. - <0.10	0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1.00- 1.5	1.5- 2.0	2.0- 2.5	2.5- 3.0	3.0- 3.5			3.5- 4.0	4.0- 4.5	4.5- 5.0	≥ 5
Unknown	1,595	594	70	20	3	2	2	2							1	2,287	46
Scientists	25															25	
Technicians	4															4	
Service	27															27	
Construction	582															582	
Laborers	2															2	
Miscellaneous	294															294	
Total Persons	2,529	594	70	20	3	2	2	2	0	0	0	0	0	0	1	3,221	
Total Person-rem	0	18	9	7	2	2	2	0	0	0	0	0	0	0	5	46	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.232
Distribution of Collective Arm and Hand Dose by Occupation and Dose Range^(a)
1990 - Male

Occupation	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem	Total Persons			
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0			4.0-4.5	4.5-5.0	≥ 5
Unknown	16	8	8	2	1		5								39	12,969
Management	30	21	13	8	6	5		3			4				90	8,267
Scientists	42	35	30	18	10	21	24	13	8	16	4		5	86	312	25,927
Technicians	43	60	78	44	37	63	41	34	17	20	22	8	9	78	553	9,469
Service	12	3	3	1		1									21	5,833
Agriculture																109
Construction	42	39	47	34	17	32	29	20	14	16	7	8		20	324	13,084
Production	46	76	117	92	74	83	38	16	8	16				60	626	7,101
Transportation	5	2	5	2	4		2								20	2,130
Laborers	5	5	7	2	5	7					4				36	1,724
Miscellaneous	1	2	7	3	1	1	2								17	3,439
Total Person-rem	0	241	251	317	206	154	213	134	90	49	68	37	21	14	243	2,036
Total Persons	79,110	7,509	1,623	911	342	178	175	79	40	18	21	10	5	3	28	90,052

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.233
Distribution of Collective Arm and Hand Dose by Occupation and Dose Range^(a)
1990 - Female

Occupation	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem	Total Persons				
	< Meas.	Meas. - <0.10	0.10- 0.25	0.25- 0.50	0.50- 0.75	0.75- 1.00	1.00- 1.5	1.5- 2.0	2.0- 2.5	2.5- 3.0	3.0- 3.5			3.5- 4.0	4.0- 4.5	4.5- 5.0	≥ 5
Unknown		3	1	2	1											8	2,988
Management		7	4	4	1	1	2									19	4,823
Scientists		8	6	6	4	2	5	2	6						6	44	4,451
Technicians		13	18	13	15	8	20	8	9	3	4	4		22	136	2,425	
Service		2													2	1,688	
Agriculture																13	
Construction		2	1	1	1	1	1			3					9	962	
Production		8	11	15	15	13	20	5	2						89	1,301	
Transportation																102	
Laborers		1		2							4				7	363	
Miscellaneous															1	633	
Total Person-rem	0	44	43	42	38	24	48	15	11	8	3	7	4	0	28	315	
Total Persons	17,821	1,379	276	119	61	28	42	9	5	3	1	2	1	0	2	19,749	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.234
Distribution of Collective Arm and Hand Dose by Occupation and Dose Range^(a)
1990 - Unknown Sex

Occupation	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem				
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0		4.0-4.5	4.5-5.0	≥ 5	
Unknown	18	9	7	2	2	2	2	2	2	2	2	2	2	5	46	2,287
Scientists																25
Technicians																4
Service																27
Construction																582
Labors																2
Miscellaneous																294
Total Person-rem	0	18	9	7	2	2	2	2	2	2	2	2	2	5	46	
Total Persons	2,529	594	70	20	3	2	2	2	2	2	2	2	2	1		3,221

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

**TABLE D.235
Distribution of Persons Receiving Arm and Hand Dose by Age and Facility Type^(a)
1990 - Male**

Facility Type	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown
Accelerator	30	240	612	811	750	734	610	569	431	233	108	178	5,306	46
Fuel/Uran. Enrichment	14	104	299	568	1,014	1,017	642	471	396	408	99	87	5,119	35
Fuel Fabrication	12	170	385	516	471	371	275	217	208	134	42		2,801	15
Fuel Processing	1	175	411	583	535	514	291	212	190	155	25		3,092	119
Maint. and Support	85	1,011	2,446	3,443	3,617	3,313	2,454	2,091	1,764	1,108	386	218	21,936	272
Reactor	3	204	829	980	996	856	563	472	386	262	39	21	5,611	185
Research, General	98	644	1,193	1,973	2,275	2,042	1,768	1,513	1,390	976	518	344	14,734	453
Research, Fusion	1	28	76	134	152	153	140	126	96	79	50	37	1,072	1
Waste Proc./Management	11	193	579	803	760	681	471	407	266	157	53	23	4,404	185
Weapons Fab. & Test.	18	285	963	1,994	2,224	2,350	1,937	1,677	1,444	896	235	211	14,234	613
Other	49	540	1,479	1,932	1,858	1,737	1,267	931	739	513	265	433	11,743	113
Total Persons	322	3,594	9,272	13,737	14,652	13,768	10,418	8,686	7,310	4,921	1,820	1,552	90,052	
Total Person-rem	1	32	210	359	392	327	275	179	159	88	12	3		2,036

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.236
Distribution of Persons Receiving Arm and Hand Dose by Age and Facility Type^(a)
1990 - Female

Facility Type	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown
Accelerator	17	57	107	120	100	83	48	39	19	10	6	17	623	2
Fuel/Uran. Enrichment	9	82	134	205	252	167	114	86	78	41	12	16	1,196	3
Fuel Fabrication	2	54	109	131	111	109	40	37	23	18	3	3	637	2
Fuel Processing	2	80	120	190	135	101	69	38	14	7	4	4	760	29
Maint. and Support	37	383	803	967	900	795	575	348	235	119	32	47	5,241	41
Reactor	2	66	131	146	104	80	38	20	15	10	2	5	619	9
Research, General	65	274	429	617	578	359	302	226	154	83	46	80	3,213	79
Research, Fusion		5	7	15	13	20	14	5	6	4	3	3	95	
Waste Proc./Management	4	95	202	187	198	145	102	58	26	22	5	2	1,046	36
Weapons Fab. & Test.	18	150	363	606	636	609	390	317	198	104	30	14	3,435	91
Other	29	352	525	528	480	363	226	159	94	44	27	57	2,884	23
Total Persons	185	1,598	2,930	3,712	3,507	2,831	1,918	1,333	862	462	170	241	19,749	
Total Person-rem	0	16	34	85	64	40	32	21	13	9	0	0	315	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.237
Distribution of Persons Receiving Arm and Hand Dose by Age and Facility Type^(a)
1990 - Unknown Sex

Facility Type	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown
Accelerator			1	1							1	15	18	
Fuel/Uran. Enrichment					1							31	32	1
Maint. and Support		1		1								583	585	
Research, General	13	8	8	1					1	1		145	177	
Weapons Fab. & Test.	1	2	2	6	3	2	3	2	2	1		872	896	9
Other			3	5	3	6	1	2	3	1	78	1,411	1,513	35
Total Persons	14	11	14	14	7	8	4	4	6	4	78	3,057	3,221	
Total Person-rem	0	0	0	0	0	0	0	0	0	0	2	43	46	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.238
Distribution of Collective Arm and Hand Dose by Age and Facility Type^(a)
1990 - Male

Facility Type	Collective Dose Equivalent in Each Age Range											≥ 65	Unknown	Total Person-rem	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	65				
Accelerator			3	7	5	6	4	6	13	1	1			46	5,306
Fuel/Uran. Enrichment			2	5	5	11	7	2	1	2				35	5,119
Fuel Fabrication			2	5	4	1	2			1				15	2,801
Fuel Processing		4	23	29	29	21	7	2	2	2	2			119	3,092
Maint. and Support		13	40	48	56	48	27	26	9	4				272	21,936
Reactor			14	20	48	29	22	25	10	15		2		185	5,611
Research, General		3	39	80	89	51	82	41	36	28	5			453	14,734
Research, Fusion														1	1,072
Waste Proc./Management		5	36	47	34	24	14	8	13	5				185	4,404
Weapons Fab. & Test.		2	37	91	98	121	99	62	69	28	5			613	14,234
Other		3	15	28	23	16	11	8	5	2				113	11,743
Total Person-rem	1	32	210	359	392	327	275	179	159	88	12	3		2,036	
Total Persons	322	3,594	9,272	13,737	14,652	13,768	10,418	8,686	7,310	4,921	1,820	1,552		90,052	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.239
Distribution of Collective Arm and Hand Dose by Age and Facility Type^(a)
1990 - Female

Facility Type	Collective Dose Equivalent in Each Age Range											Total Person-rem				
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65		Unknown			
Accelerator															2	623
Fuel/Uran. Enrichment					1										3	1,196
Fuel Fabrication			1	1											2	637
Fuel Processing		2	3	10	6	6	2								29	760
Maint. and Support		6	8	12	7	3	3	2							41	5,241
Reactor		1		1	5	2									9	619
Research, General		1	4	39	10	2	7	5	7	4					79	3,213
Research, Fusion																95
Waste Proc./Management		3	7	6	6	3	7	2	1	1					36	1,046
Weapons Fab. & Test.		1	7	12	21	19	11	10	5	4					91	3,435
Other		2	3	4	6	4	2	1							23	2,884
Total Person-rem	0	16	34	85	64	40	32	21	13	9	0	0	0	0	315	
Total Persons	185	1,598	2,930	3,712	3,507	2,831	1,918	1,333	862	462	170	241			19,749	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.240
Distribution of Collective Arm and Hand Dose by Age and Facility Type^(a)
1990 - Unknown Sex

Facility Type	Collective Dose Equivalent in Each Age Range											Total Person-rem	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65		Unknown
Accelerator													18
Fuel/Uran. Enrichment												1	32
Maint. and Support													585
Research, General													177
Weapons Fab. & Test.											8	9	896
Other										2	33	35	1,513
Total Person-rem	0	0	0	0	0	0	0	0	0	0	2	43	46
Total Persons	14	11	14	14	7	8	4	4	6	4	78	3,057	3,221

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.241
Distribution of Persons Receiving Arm and Hand Dose by Age and Occupation^(a)
1990 - Male

Occupation	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown
Unknown	121	591	1,084	1,791	1,704	1,782	1,677	1,519	1,133	721	414	432	12,969	39
Management	15	92	356	853	1,367	1,547	1,261	1,122	888	569	150	47	8,267	90
Scientists	18	870	2,740	3,974	4,150	3,918	3,007	2,583	2,309	1,520	618	220	25,927	312
Technicians	20	433	1,176	1,736	1,712	1,391	876	710	685	442	102	186	9,469	553
Service	22	301	1,041	1,224	901	746	473	362	272	190	123	178	5,833	21
Agriculture		8	11	21	16	18	4	10	11	3	2	5	109	
Construction	59	718	1,390	1,904	2,194	2,180	1,529	1,209	932	689	150	130	13,084	324
Production	10	207	745	1,119	1,394	1,134	831	562	552	432	97	18	7,101	626
Transportation	3	44	165	334	403	370	245	211	202	107	23	23	2,130	20
Laborers	16	95	231	326	317	258	155	113	98	58	11	46	1,724	36
Miscellaneous	38	235	333	455	494	424	360	285	228	190	130	267	3,439	17
Total Persons	322	3,594	9,272	13,737	14,652	13,768	10,418	8,686	7,310	4,921	1,820	1,552	90,052	
Total Person-rem	1	32	210	359	392	327	275	179	159	88	12	3		2,036

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.242
Distribution of Persons Receiving Arm and Hand Dose by Age and Occupation^(a)
1990 - Female

Occupation	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown
Unknown	69	269	372	455	450	424	340	263	159	80	50	57	2,988	8
Management	22	299	541	739	805	837	618	464	310	126	42	20	4,823	19
Scientists	5	354	886	1,010	838	526	349	212	143	82	30	16	4,451	44
Technicians	20	201	378	547	493	365	165	114	68	47	7	20	2,425	136
Service	12	175	240	330	297	207	147	102	64	57	18	39	1,688	2
Agriculture		1	2	1	3	4		2					13	
Construction	11	115	203	193	175	114	66	32	26	20	1	6	962	9
Production	5	64	153	261	272	220	150	77	59	32	7	1	1,301	89
Transportation		2	15	22	21	15	14	5	3	3	2		102	
Laborers	12	20	46	61	65	63	40	38	8	5		5	363	7
Miscellaneous	29	98	94	93	88	56	29	24	22	10	13	77	633	1
Total Persons	185	1,598	2,930	3,712	3,507	2,831	1,918	1,333	862	462	170	241	19,749	
Total Person-rem	0	16	34	85	64	40	32	21	13	9	0	0		315

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.243
Distribution of Persons Receiving Arm and Hand Dose by Age and Occupation^(a)
1990 - Unknown Sex

Occupation	Number of Persons Receiving Radiation Doses in Each Age Range													Total Persons	Total Person-rem
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65	Unknown			
Unknown	1	2	6	12	6	8	4	4	5	2	78	2,159	2,287	46	
Scientists				2								23	25		
Technicians												4	4		
Service												27	27		
Construction		1		1						1		579	582		
Laborers												2	2		
Miscellaneous	13	8	6	1	1				1	1		263	294		
Total Persons	14	11	14	14	7	8	4	4	6	4	78	3,057	3,221		
Total Person-rem	0	0	0	0	0	0	0	0	0	0	2	43	46		

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.244
Distribution of Collective Arm and Hand Dose by Age and Occupation^(a)
1990 - Male

Occupation	Collective Dose Equivalent in Each Age Range											Total Person-rem		
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65		Unknown	
Unknown	-	1	4	5	5	5	10	3	3	2			39	12,969
Management		1	5	16	16	17	9	7	11	5	1		90	8,267
Scientists		1	28	41	52	48	37	44	33	23	2	1	312	25,927
Technicians		10	61	128	126	56	85	33	30	21	3	1	553	9,469
Service		1	5	4	4	4	2	1					21	5,833
Agriculture														109
Construction		6	30	41	64	71	36	40	27	7	1		324	13,084
Production		10	70	108	109	117	90	44	46	28	4		626	7,101
Transportation		1	1	5	3	4	1	1	3				20	2,130
Laborers			6	7	10	4	4	3	1				36	1,724
Miscellaneous				4	2	2	2	2	3	1			17	3,439
Total Person-rem	1	32	210	359	392	327	275	179	159	88	12	3		2,036
Total Persons	322	3,594	9,272	13,737	14,652	13,768	10,418	8,686	7,310	4,921	1,820	1,552		90,052

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.245
Distribution of Collective Arm and Hand Dose by Age and Occupation^(a)
1990 - Female

Occupation	Collective Dose Equivalent in Each Age Range											Total Person-rem		
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65		Unknown	
Unknown			1	2	2	1	1	1					8	2,988
Management		1	3	3	2	4	2	3		1			19	4,823
Scientists		1	5	13	4	3	6	1	7	3			44	4,451
Technicians		-	8	15	47	26	15	7	11	3	4		136	2,425
Service											1		2	1,688
Agriculture														13
Construction					2	2	4						9	962
Production		5	9	18	22	13	15	4	3	1			89	1,301
Transportation														102
Laborers													7	363
Miscellaneous													1	633
Total Person-rem	0	16	34	85	64	40	32	21	13	9	0	0	315	
Total Persons	185	1,598	2,930	3,712	3,507	2,831	1,918	1,333	862	462	170	241	19,749	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.246
Distribution of Collective Arm and Hand Dose by Age and Occupation^(a)
1990 - Unknown Sex

Occupation	Collective Dose Equivalent in Each Age Range											Total Person-rem			
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65		Unknown		
Unknown												2	43	46	2,287
Scientists															25
Technicians															4
Service															27
Construction															582
Laborers															2
Miscellaneous															294
Total Person-rem	0	0	0	0	0	0	0	0	0	0	0	2	43	46	
Total Persons	14	11	14	14	7	8	4	4	6	4	78	3,057		3,221	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.247
Distribution of Persons Receiving Arm and Hand Dose by Occupation and Facility Type^(a)
1990 - Male

Facility Type	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer	Misc.	Total Persons	Total Person-rem
Accelerator	1,164	131	2,021	1,402	122	17	139	100	34	1	175	5,306	46
Fuel/Uran. Enrichment	244	790	1,146	512	343	1	1,019	782	46	177	59	5,119	35
Fuel Fabrication	33	254	835	238	135		904	256	41	85	20	2,801	15
Fuel Processing	8	334	1,340	190	43	1	472	611	42	23	28	3,092	119
Maint. and Support	4,412	1,939	3,045	1,277	1,311	25	7,179	1,147	723	829	49	21,936	272
Reactor	21	753	2,285	545	130		640	712	85	61	379	5,611	185
Research, General	2,959	917	5,651	1,904	549	9	505	346	57	110	1,727	14,734	453
Research, Fusion	115	77	443	216	48		104	32		1	36	1,072	1
Waste Proc./Management	109	563	1,434	655	174		733	482	160	55	39	4,404	185
Weapons Fab. & Test.	2,082	1,690	3,731	1,741	840		1,037	2,367	405	242	99	14,234	613
Other	1,822	819	3,996	789	2,138	56	352	266	537	140	828	11,743	113
Total Persons	12,969	8,267	25,927	9,469	5,833	109	13,084	7,101	2,130	1,724	3,439	90,052	
Total Person-rem	39	90	312	553	21	0	324	626	20	36	17		2,036

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

**TABLE D.248
Distribution of Persons Receiving Arm and Hand Dose by Occupation and Facility Type^(a)
1990 - Female**

Facility Type	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer	Misc.	Total Persons	Total Person-rem
Accelerator	169	71	226	101	41	4	4	4		7		623	2
Fuel/Uran. Enrichment	71	464	217	169	81	43	97	33	3	33	18	1,196	3
Fuel Fabrication	8	154	214	88	23	41	85	3	3	19	2	637	2
Fuel Processing	1	186	240	57	29	45	197	-	3	1	1	760	29
Maint. and Support	1,107	1,491	705	620	272	640	140	46	205	15	5,241	41	41
Reactor	3	163	171	63	21	36	131	2	4	25	619	9	9
Research, General	775	502	862	536	113	2	36	1	17	353	3,213	79	79
Research, Fusion	12	29	29	15	6	2				2	95		
Waste Proc./Management	19	228	208	195	195	35	139	14	4	9	1,046	36	36
Weapons Fab. & Test.	510	1,020	750	380	147	97	440	10	55	26	3,435	91	91
Other	313	515	829	201	760	11	32	20	25	175	2,884	23	23
Total Persons	2,988	4,823	4,451	2,425	1,688	13	962	1,301	102	363	633	19,749	
Total Person-rem	8	19	44	136	2	0	9	89	0	7	1	315	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.249
Distribution of Persons Receiving Arm and Hand Dose by Occupation and Facility Type^(a)
1990 - Unknown Sex

Facility Type	* * * * * Number of Persons Receiving Radiation Doses in Each Occupation * * * * *											Total Person-rem
	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer	Misc.	
Accelerator	2		11	3	1		1					18
Fuel/Uran. Enrichment	32											32
Maint. and Support					3		581		1			585
Research, General	6		12		1					158		177
Weapons Fab. & Test.	872				22				1		1	896
Other	1,375		2	1						135		1,513
Total Persons	2,287	0	25	4	27	0	582	0	0	2	294	3,221
Total Person-rem	46	0	0	0	0	0	0	0	0	0	0	46

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.250
Distribution of Collective Arm and Hand Dose by Occupation and Facility Type^(a)
1990 - Male

Facility Type	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Occupation	Production	Transport	Laborer	Misc.	Person-rem	Total Persons
Accelerator			13	26			1	2	4				46	5,306
Fuel/Uran. Enrichment	2	2	2	13	1		6	10					35	5,119
Fuel Fabrication		4	1	8				2					15	2,801
Fuel Processing		2	13	4			22	71	5	1			119	3,092
Maint. and Support		9	29	48	10		109	47	2	18			272	21,936
Reactor		5	27	44			59	45		4			185	5,611
Research, General	4	8	149	216	2		52	15	1	7	1		453	14,734
Research, Fusion				1									1	1,072
Waste Proc./Management		9	15	37			40	80	4				185	4,404
Weapons Fab. & Test.	21	49	53	80	6		29	352	3	5	16		613	14,234
Other	12	3	9	77			6	5					113	11,743
Total Person-rem	39	90	312	553	21	0	324	626	20	36	17		2,036	
Total Persons	12,969	8,267	25,927	9,469	5,833	109	13,084	7,101	2,130	1,724	3,439		90,052	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

**TABLE D.251
Distribution of Collective Arm and Hand Dose by Occupation and Facility Type^(a)
1990 - Female**

Facility Type	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer	Misc.	Person-rem	Total Persons
Accelerator				1								2	623
Fuel/Uran. Enrichment		1	1	1								3	1,196
Fuel Fabrication			1						1			2	637
Fuel Processing			2	2		1		24				29	760
Maint. and Support		3	1	24	1			9		1		41	5,241
Reactor				2				3		4		9	619
Research, General	2	2	25	49			1		1			79	3,213
Research, Fusion													95
Waste Proc./Management		3	1	15				16				36	1,046
Weapons Fab. & Test.	5	9	11	24	1			34		2	1	91	3,435
Other	1		1	19								23	2,884
Total Person-rem	8	19	44	136	2	0		89	0	7	1	315	
Total Persons	2,988	4,823	4,451	2,425	1,688	13	962	1,301	102	363	633		19,749

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.252
Distribution of Collective Arm and Hand Dose by Occupation and Facility Type^(a)
1990 - Unknown Sex

Facility Type	* * * * * Collective Dose-Equivalent in Each Occupation * * * * *											Total Person-rem	
	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer	Misc.		
Accelerator													18
Fuel/Uran. Enrichment												1	32
Maint. and Support													585
Research, General													177
Weapons Fab. & Test.												9	896
Other												35	1,513
Total Person-rem	46	0	0	0	0	0	0	0	0	0	0	46	
Total Persons	2,287	0	25	4	27	0	582	0	0	2	294		3,221

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.253
Distribution of Leg and Foot Dose by Facility Type and Dose Range^(a)
1990 - Male

Facility Type	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)													Total Persons	Total Person-rem		
	< Meas.	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50	3.50-4.00	4.00-4.50			4.50-5.00	≥ 5
Accelerator	4,949	237	69	41	6	3	1									5,306	41
Fuel/Uran. Enrichment	4,738	343	29	9												5,119	22
Fuel Fabrication	2,781	18	2													2,801	1
Fuel Processing	3,045	15	12	16	4											3,092	11
Maint. and Support	20,515	1,152	132	76	28	16	14	3								21,936	127
Reactor	5,136	327	77	39	21	9	2									5,611	59
Research, General	13,615	862	148	69	12	14	13	1								14,734	110
Research, Fusion	1,072															1,072	
Waste Proc./Management	3,237	901	168	70	18	7	3									4,404	95
Weapons Fab. & Test.	12,822	917	261	137	55	21	17	3	1							14,234	212
Other	11,424	288	19	10	1	1										11,743	14
Total Persons	83,334	5,060	917	467	145	71	50	7	1	0	0	0	0	0	0	90,052	
Total Person-rem	0	165	141	165	87	61	58	12	2	0	0	0	0	0	0		692

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.254
Distribution of Leg and Foot Dose by Facility Type and Dose Range^(a)
1990 - Female

Facility Type	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons-rem					
	< Meas.	Meas. - <0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5		3.5-4.0	4.0-4.5	4.5-5.0	≥ 5	
Accelerator	602	17	3	1												623	2
Fuel/Uran. Enrichment	1,139	54	3													1,196	3
Fuel Fabrication	636	1														637	
Fuel Processing	756	1	1	1	1											760	1
Maint. and Support	5,029	170	26	12	2	2										5,241	15
Reactor	579	29	5	3	1	2										619	5
Research, General	3,056	129	13	13	1	1										3,213	11
Research, Fusion	95															95	
Waste Proc./Management	769	242	17	11	4	2	1									1,046	19
Weapons Fab. & Test.	3,245	148	30	8	1	1	1	1								3,435	20
Other	2,846	33	4	1												2,884	2
Total Persons	18,752	824	102	48	11	9	1	2	0	0	0	0	0	0	0	19,749	
Total Person-rem	0	26	15	17	7	8	1	3	0	0	0	0	0	0	0		77

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.255
Distribution of Leg and Foot Dose by Facility Type and Dose Range^(a)
1990 - Unknown Sex

Facility Type	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem				
	< Meas.	Meas. - <0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5			3.5-4.0	4.0-4.5	4.5-5.0	≥ 5
Accelerator																18	
Fuel/Uran. Enrichment	5															32	1
Maint. and Support	585															585	
Research, General	171															177	
Weapons Fab. & Test.	829	60	5	1											1	896	9
Other	943	501	54	11	3	1										1,513	27
Total Persons	2,551	594	59	12	3	1	0	0	0	0	0	0	0	0	0	3,221	1
Total Person-rem	0	18	8	4	2	1	0	0	0	0	0	0	0	0	0		37

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.256
Distribution of Collective Leg and Foot Dose by Facility Type and Dose Range^(a)
1990 - Male

Facility Type	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem	Total Persons				
	< Meas.	Meas. - <0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50			3.50-4.00	4.00-4.50	4.50-5.00	≥ 5
Accelerator		8	10	15	3	3	1									41	5,306
Fuel/Uran. Enrichment		15	4	3												22	5,119
Fuel Fabrication																1	2,801
Fuel Processing		1	2	6	2											11	3,092
Maint. and Support		28	20	27	17	14	16	5								127	21,936
Reactor		10	12	13	13	8	3									59	5,611
Research, General		27	23	25	8	12	15	2								110	14,734
Research, Fusion																	1,072
Waste Proc./Management		26	26	24	10	6	3									95	4,404
Weapons Fab. & Test.		43	41	50	33	18	20	5	2							212	14,234
Other		7	3	3	1	1										14	11,743
Total Person-rem	0	165	141	165	87	61	58	12	2	0	0	0	0	0	0	692	
Total Persons	83,334	5,060	917	467	145	71	50	7	1	0	0	0	0	0	0	90,052	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.257
Distribution of Collective Leg and Foot Dose by Facility Type and Dose Range^(a)
1990 - Female

Facility Type	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem					
	< Meas.	Meas. - <0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5		3.5-4.0	4.0-4.5	4.5-5.0	≥ 5	
Accelerator					1											2	623
Fuel/Uran. Enrichment					3											3	1,196
Fuel Fabrication																	637
Fuel Processing						1										1	760
Maint. and Support				4	4	4	1	2								15	5,241
Reactor			1	1	1	2										5	619
Research, General			3	2	4	1	1									11	3,213
Research, Fusion																	95
Waste Proc./Management			7	3	4	2	2	2								19	1,046
Weapons Fab. & Test.			7	4	3	1	1	2								20	3,435
Other			1	1		1										2	2,884
Total Person-rem	0	26	15	17	7	8	1	3	0	0	0	0	0	0	0	77	
Total Persons	18,752	824	102	48	11	9	1	2	0	0	0	0	0	0	0		19,749

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.258
Distribution of Collective Leg and Foot Dose by Facility Type and Dose Range^(a)
1990 - Unknown Sex

Facility Type	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem	Total Persons			
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50	3.50-4.00			4.00-4.50	4.50-5.00	≥ 5.00
Accelerator																18
Fuel/Uran. Enrichment					1										1	32
Maint. and Support																585
Research, General																177
Weapons Fab. & Test.				3	1										5	896
Other	14	7	4	2	1										27	1,513
Total Person-rem	0	18	8	4	2	1	0	0	0	0	0	0	0	0	5	37
Total Persons	2,551	594	59	12	3	1	0	0	0	0	0	0	0	0	1	3,221

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.259
Distribution of Leg and Foot Dose by Age and Dose Range^(a)
1990 - Male

Age Range	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem				
	< Meas.	Meas. - <0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5			3.5-4.0	4.0-4.5	4.5-5.0	≥ 5
19 and less	315	6	1													322	
20 - 24	3,477	98	8	7	3	1										3,594	9
25 - 29	8,693	420	98	41	13	4	2	1								9,272	57
30 - 34	12,694	754	151	85	27	15	9	2								13,737	121
35 - 39	13,437	920	172	73	22	13	14	1								14,652	126
40 - 44	12,637	866	142	75	22	17	8	1								13,768	116
45 - 49	9,586	627	108	69	17	5	6									10,418	82
50 - 54	7,966	550	90	50	16	10	3	1								8,686	73
55 - 59	6,717	423	86	54	17	5	7	1								7,310	71
60 - 64	4,569	275	55	12	7	1	1	1								4,921	31
65 and greater	1,705	107	6	1	1											1,820	5
Unknown	1,538	14														1,552	
Total Persons	83,334	5,060	917	467	145	71	50	7	1	0	0	0	0	0	0	90,052	0
Total Person-rem	0	165	141	165	87	61	58	12	2	0	0	0	0	0	0	692	0

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.260
Distribution of Leg and Foot Dose by Age and Dose Range^(a)
1990 - Female

Age Range	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)																	Total Persons	Total Person-rem
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50	3.50-4.00	4.00-4.50	4.50-5.00	≥ 5.00					
19 and less	179	6																185	
20 - 24	1,533	49	11	1	2	2												1,598	6
25 - 29	2,798	106	19	5	1	1												2,930	9
30 - 34	3,536	154	10	6	4	2												3,712	12
35 - 39	3,309	164	22	8	1	2	1											3,507	15
40 - 44	2,699	108	10	13	1													2,831	10
45 - 49	1,804	89	14	9	1	1	1											1,918	11
50 - 54	1,253	67	8	2	2	1												1,333	6
55 - 59	810	44	5	3														862	3
60 - 64	428	29	3	1			1											462	4
65 and greater	163	7																170	
Unknown	240	1																241	
Total Persons	18,752	824	102	48	11	9	1	2	0	0	0	0	0	0	0	0	0	19,749	0
Total Person-rem	0	26	15	17	7	8	1	3	0	0	0	0	0	0	0	0	0	77	77

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.261
Distribution of Leg and Foot Dose by Age and Dose Range^(a)
1990 - Unknown Sex

Age Range	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem				
	< Meas.	Meas. - <0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5			3.5-4.0	4.0-4.5	4.5-5.0	≥ 5
19 and less	13	1														14	
20 - 24	11															11	
25 - 29	13	1														14	
30 - 34	13	1														14	
35 - 39	6		1													7	
40 - 44	8															8	
45 - 49	1	3														4	
50 - 54	2	2														4	
55 - 59	5	1														6	
60 - 64	4															4	
65 and greater	49	21	7	1												78	2
Unknown	2,426	564	51	11	3	1									1	3,057	35
Total Persons	2,551	594	59	12	3	1	0	0	0	0	0	0	0	0	1	3,221	
Total Person-rem	0	18	8	4	2	1	0	0	0	0	0	0	0	0	5		37

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.262
Distribution of Collective Leg and Foot Dose by Age and Dose Range^(a)
1990 - Male

Age Range	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem			
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0		4.0-4.5	4.5-5.0	≥ 5
19 and less															322
- 20 - 24	3	1	2	2	1										9
25 - 29	13	15	14	7	3	2	2								57
30 - 34	25	23	30	16	13	11	3								121
35 - 39	30	26	26	14	12	16	2								126
40 - 44	29	23	26	13	15	9	2								116
45 - 49	20	16	24	10	4	7									82
50 - 54	18	13	18	10	8	4	2								73
55 - 59	14	13	19	10	4	8	2								71
60 - 64	10	9	4	4	1	1	2								31
65 and greater	3	1		1											5
Unknown															1,552
Total Person-rem	0	165	141	165	87	61	58	12	2	0	0	0	0	0	692
Total Persons	83,334	5,060	917	467	145	71	50	7	1	0	0	0	0	0	90,052

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.263
Distribution of Collective Leg and Foot Dose by Age and Dose Range^(a)
1990 - Female

Age Range	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem	Total Persons			
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0			4.0-4.5	4.5-5.0	≥ 5
19 and less																185
20 - 24	1	2		1	2										6	1,598
25 - 29	3	3	2	1	1										9	2,930
30 - 34	5	2	2	2	2										12	3,712
35 - 39	5	3	3	1	2	1									15	3,507
40 - 44	3	2	5	1											10	2,831
45 - 49	3	2	3	1	1	2									11	1,918
50 - 54	2	1	1	1	1										6	1,333
55 - 59	1	1	1												3	862
60 - 64	1								2						4	462
65 and greater																170
Unknown																241
Total Person-rem	0	26	15	17	7	8	1	3	0	0	0	0	0	0	0	77
Total Persons	18,752	824	102	48	11	9	1	2	0	0	0	0	0	0	0	19,749

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.264
Distribution of Collective Leg and Foot Dose by Age and Dose Range^(a)
1990 - Unknown Sex

Age Range	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem	Total Persons				
	< Meas.	Meas. - <0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50			3.50-4.00	4.00-4.50	4.50-5.00	≥ 5
19 and less																	14
20 - 24																	11
25 - 29																	14
30 - 34																	14
35 - 39																	7
40 - 44																	8
45 - 49																	4
50 - 54																	4
55 - 59																	6
60 - 64																	4
65 and greater																	2
Unknown																	35
Total Person-rem																	37
Total Persons																	3,221

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.265
Distribution of Leg and Foot Dose by Occupation and Dose Range^(a)
1990 - Male

Occupation	* * * * * Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem) * * * * *											Total Persons	Total Person-rem			
	< Meas.	0.10- Meas.- <0.10	0.25- 0.10- 0.25	0.50- 0.25- 0.50	0.75- 0.50- 0.75	1.00- 0.75- 1.00	1.5- 1.0- 1.5	2.0- 1.5- 2.0	2.5- 2.0- 2.5	3.0- 2.5- 3.0	3.5- 3.0- 3.5			4.0- 3.5- 4.0	4.5- 4.0- 4.5	5.0- 4.5- 5.0
Unknown	12,706	238	18	7											12,969	13
Management	7,344	841	60	16	5	1									8,267	40
Scientists	24,760	1,035	97	26	4	2	2	1							25,927	58
Technicians	8,358	743	192	113	27	18	15	2	1						9,469	150
Service	5,479	328	21	4	1										5,833	14
Agriculture	109														109	
Construction	11,994	803	153	73	34	17	8	2							13,084	128
Production	5,671	793	331	192	64	30	18	2							7,101	242
Transportation	1,954	157	9	9	1										2,130	9
Laborers	1,571	105	27	9	4	2	6								1,724	22
Miscellaneous	3,388	17	9	18	5	1	1								3,439	15
Total Persons	83,334	5,060	917	467	145	71	50	7	1	0	0	0	0	0	90,052	0
Total Person-rem	0	165	141	165	87	61	58	12	2	0	0	0	0	0	692	0

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.266
Distribution of Leg and Foot Dose by Occupation and Dose Range^(a)
1990 - Female

Occupation	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem				
	< Meas.	Meas. - <0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50			3.50-4.00	4.00-4.50	4.50-5.00	≥ 5.00
Unknown	2,961	24	3													2,988	1
Management	4,616	188	12	6	1											4,823	9
Scientists	4,320	120	5	6												4,451	6
Technicians	2,164	206	29	17	4	3	2									2,425	25
Service	1,621	67														1,688	2
Agriculture	13															13	
Construction	912	43	5	1		1										962	4
Production	1,090	141	43	15	6	5	1									1,301	26
Transportation	101	1														102	
Laborers	325	31	4	3												363	3
Miscellaneous	629	3	1													633	
Total Persons	18,752	824	102	48	11	9	1	2	0	0	0	0	0	0	0	19,749	
Total Person-rem	0	26	15	17	7	8	1	3	0	0	0	0	0	0	0		77

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

**TABLE D.267
Distribution of Leg and Foot Dose by Occupation and Dose Range^(a)
1990 - Unknown**

Occupation	Number of Persons Receiving Radiation Doses in Each Dose-Equivalent Range (rem)											Total Persons	Total Person-rem				
	< Meas.	Meas. - <0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50			3.50-4.00	4.00-4.50	4.50-5.00	≥ 5
Unknown	1,617	594	59	12	3	1									1	2,287	37
Scientists	25															25	
Technicians	4															4	
Service	27															27	
Construction	582															582	
Laborers	2															2	
Miscellaneous	294															294	
Total Persons	2,551	594	59	12	3	1	0	0	0	0	0	0	0	0	1	3,221	
Total Person-rem	0	18	8	4	2	1	0	0	0	0	0	0	0	0	5		37

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.268
Distribution of Collective Leg and Foot Dose by Occupation and Dose Range^(a)
1990 - Male

Occupation	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem				
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.0-1.5	1.5-2.0	2.0-2.5	2.5-3.0	3.0-3.5	3.5-4.0		4.0-4.5	4.5-5.0	≥ 5	
Unknown	8	3	2												13	12,969
Management	22	9	5	3	1										40	8,267
Scientists	27	14	9	2	2	2									58	25,927
Technicians	25	30	40	16	16	18	3	2	-						150	9,469
Service	10	3	1	1											14	5,833
Agriculture																109
Construction	31	24	26	21	15	9	3								128	13,084
Production	33	53	68	38	26	21	4								242	7,101
Transportation	4	1	4	1											9	2,130
Laborers	4	4	3	2	2	7									22	1,724
Miscellaneous	1	2	7	3	1	1									15	3,439
Total Person-rem	0	165	141	165	87	61	58	12	2	0	0	0	0	0	692	
Total Persons	83,334	5,060	917	467	145	71	50	7	1	0	0	0	0	0		90,052

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.269
Distribution of Collective Leg and Foot Dose by Occupation and Dose Range^(a)
1990 - Female

Occupation	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem	Total Persons				
	< Meas.	0.10- Meas.	0.25- 0.10	0.50- 0.25	0.75- 0.50	1.00- 0.75	1.50- 1.00	2.00- 1.50	2.50- 2.00	3.00- 2.50	3.50- 3.00			4.00- 3.50	4.50- 4.00	5.00- 4.50	≥ 5
Unknown																1	2,988
Management																9	4,823
Scientists																6	4,451
Technicians																25	2,425
Service																2	1,688
Agriculture																	13
Construction																4	962
Production																26	1,301
Transportation																	102
Laborers																3	363
Miscellaneous																	633
Total Person-rem	0	26	15	17	7	8	1	3	0	0	0	0	0	0	0	77	
Total Persons	18,752	824	102	48	11	9	1	2	0	0	0	0	0	0	0	19,749	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.270
Distribution of Collective Leg and Foot Dose by Occupation and Dose Range^(a)
1990 - Unknown Sex

Occupation	Collective Dose-Equivalent in Each Dose Range (rem)											Total Person-rem				
	Meas. < 0.10	0.10-0.25	0.25-0.50	0.50-0.75	0.75-1.00	1.00-1.50	1.50-2.00	2.00-2.50	2.50-3.00	3.00-3.50	3.50-4.00		4.00-4.50	4.50-5.00	≥ 5.00	
Unknown	18	8	4	4	2	1								5	37	2,287
Scientists																25
Technicians																4
Service																27
Construction																582
Laborers																2
Miscellaneous																294
Total Person-rem	0	18	8	4	2	1	0	0	0	0	0	0	0	0	5	37
Total Persons	2,551	594	59	12	3	1	0	0	0	0	0	0	0	0	1	3,221

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.271
Distribution of Persons Receiving Leg and Foot Dose by Age and Facility Type^(a)
1990 - Male

Facility Type	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown
Accelerator	30	240	612	811	750	734	610	569	431	233	108	178	5,306	41
Fuel/Uran. Enrichment	14	104	299	568	1,014	1,017	642	471	396	408	99	87	5,119	22
Fuel Fabrication	12	170	385	516	471	371	275	217	208	134	42		2,801	1
Fuel Processing	1	175	411	583	535	514	291	212	190	155	25		3,092	11
Maint. and Support	85	1,011	2,446	3,443	3,617	3,313	2,454	2,091	1,764	1,108	386	218	21,936	127
Reactor	3	204	829	980	996	856	563	472	386	262	39	21	5,611	59
Research, General	98	644	1,193	1,973	2,275	2,042	1,768	1,513	1,390	976	518	344	14,734	110
Research, Fusion	1	28	76	134	152	153	140	126	96	79	50	37	1,072	
Waste Proc./Management	11	193	579	803	760	681	471	407	266	157	53	23	4,404	95
Weapons Fab. & Test.	18	285	963	1,994	2,224	2,350	1,937	1,677	1,444	896	235	211	14,234	212
Other	49	540	1,479	1,932	1,858	1,737	1,267	931	739	513	265	433	11,743	14
Total Persons	322	3,594	9,272	13,737	14,652	13,768	10,418	8,686	7,310	4,921	1,820	1,552	90,052	
Total Person-rem	0	9	57	121	126	116	82	73	71	31	5	0	692	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.272
Distribution of Persons Receiving Leg and Foot Dose by Age and Facility Type^(a)
1990 - Female

Facility Type	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown
Accelerator	17	57	107	120	100	83	48	39	19	10	6	17	623	2
Fuel/Uran. Enrichment	9	82	134	205	252	167	114	86	78	41	12	16	1,196	3
Fuel Fabrication	2	54	109	131	111	109	40	37	23	18	3		637	
Fuel Processing	2	80	120	190	135	101	69	38	14	7	4		760	1
Maint. and Support	37	383	803	967	900	795	575	348	235	119	32	47	5,241	15
Reactor	2	66	131	146	104	80	38	20	15	10	2	5	619	5
Research, General	65	274	429	617	578	359	302	226	154	83	46	80	3,213	11
Research, Fusion		5	7	15	13	20	14	5	6	4	3	3	95	
Waste Proc./Management	4	95	202	187	198	145	102	58	26	22	5	2	1,046	19
Weapons Fab. & Test.	18	150	363	606	636	609	390	317	198	104	30	14	3,435	20
Other	29	352	525	528	480	363	226	159	94	44	27	57	2,884	2
Total Persons	185	1,598	2,930	3,712	3,507	2,831	1,918	1,333	862	462	170	241	19,749	
Total Person-rem	0	6	9	12	15	10	11	6	3	4	0	0	77	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.273
Distribution of Persons Receiving Leg and Foot Dose by Age and Facility Type^(a)
1990 - Unknown Sex

Facility Type	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem		
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown	
Accelerator			1	1							1		15	18	
Fuel/Uran. Enrichment					1								31	32	1
Maint. and Support		1		1									583	585	
Research, General	13	8	8	1					1		1		145	177	
Weapons Fab. & Test.	1	2	2	6	3	2	2	3	2	1	1		872	896	9
Other			3	5	3	6	1	2	3	1	1	78	1,411	1,513	27
Total Persons	14	11	14	14	7	8	4	4	6	4	4	78	3,057	3,221	
Total Person-rem	0	0	0	0	0	0	0	0	0	0	0	2	35		37

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.274
Distribution of Collective Leg and Foot Dose by Age and Facility Type^(a)
1990 - Male

Facility Type	Collective Dose Equivalent in Each Age Range											Total Person-rem		
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65		Unknown	
Accelerator			3	6	5	6	4	6	9	1	1		41	5,306
Fuel/Uran. Enrichment			2	2	5	6	4	2	1	1			22	5,119
Fuel Fabrication													1	2,801
Fuel Processing			2	3	2	2	1						11	3,092
Maint. and Support		4	16	29	23	22	12	12	7	2			127	21,936
Reactor			8	12	12	9	5	5	5	3			59	5,611
Research, General		2	6	20	26	13	11	10	14	7	2		110	14,734
Research, Fusion														1,072
Waste Proc./Management		2	16	22	17	16	6	5	8	3			95	4,404
Weapons Fab. & Test.			4	25	33	42	36	32	26	13	1		212	14,234
Other			1	2	4	2	2	1	1	1			14	11,743
Total Person-rem	0	9	57	121	126	116	82	73	71	31	5	0	692	
Total Persons	322	3,594	9,272	13,737	14,652	13,768	10,418	8,686	7,310	4,921	1,820	1,552	90,052	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.275
Distribution of Collective Leg and Foot Dose by Age and Facility Type^(a)
1990 - Female

Facility Type	Collective Dose Equivalent in Each Age Range											Total Person-rem	Total Persons			
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown		
Accelerator			1												2	623
Fuel/Uran. Enrichment					1										3	1,196
Fuel Fabrication																637
Fuel Processing					1										1	760
Maint. and Support		3	3	3	2	2	1	1							15	5,241
Reactor		1			1	2									5	619
Research, General				1	3	1	1	1	1	1	1				11	3,213
Research, Fusion																95
Waste Proc./Management		2	3	3	4	2	5	1	1						19	1,046
Weapons Fab. & Test.			1	1	5	3	2	3	1	2					20	3,435
Other						1									2	2,884
Total Person-rem	0	6	9	12	15	10	11	6	3	4	0	0	0	0	77	
Total Persons	185	1,598	2,930	3,712	3,507	2,831	1,918	1,333	862	462	170	241			19,749	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.276
Distribution of Collective Leg and Foot Dose by Age and Facility Type^(a)
1990 - Unknown Sex

Facility Type	Collective Dose Equivalent in Each Age Range											Total Person-rem				
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65		Unknown			
Accelerator																18
Fuel/Uran. Enrichment															1	32
Maint. and Support																585
Research, General																177
Weapons Fab. & Test.															8	896
Other													2	25	27	1,513
Total Person-rem	0	0	0	0	0	0	0	0	0	0	0	0	2	35	37	
Total Persons	14	11	14	14	7	8	4	4	4	6	4	78	3,057			3,221

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.277
Distribution of Persons Receiving Leg and Foot Dose by Age and Occupation^(a)
1990 - Male

Occupation	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown
Unknown	121	591	1,084	1,791	1,704	1,782	1,677	1,519	1,133	721	414	432	12,969	13
Management	15	92	356	853	1,367	1,547	1,261	1,122	888	569	150	47	8,267	40
Scientists	18	870	2,740	3,974	4,150	3,918	3,007	2,583	2,309	1,520	618	220	25,927	58
Technicians	20	433	1,176	1,736	1,712	1,391	876	710	685	442	102	186	9,469	150
Service	22	301	1,041	1,224	901	746	473	362	272	190	123	178	5,833	14
Agriculture		8	11	21	16	18	4	10	11	3	2	5	109	
Construction	59	718	1,390	1,904	2,194	2,180	1,529	1,209	932	689	150	130	13,084	128
Production	10	207	745	1,119	1,394	1,134	831	562	552	432	97	18	7,101	242
Transportation	3	44	165	334	403	370	245	211	202	107	23	23	2,130	9
Laborers	16	95	231	326	317	258	155	113	98	58	11	46	1,724	22
Miscellaneous	38	235	333	455	494	424	360	285	228	190	130	267	3,439	15
Total Persons	322	3,594	9,272	13,737	14,652	13,768	10,418	8,686	7,310	4,921	1,820	1,552	90,052	
Total Person-rem	0	9	57	121	126	116	82	73	71	31	5	0	692	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.278
Distribution of Persons Receiving Leg and Foot Dose by Age and Occupation^(a)
1990 - Female

Occupation	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown
Unknown	69	269	372	455	450	424	340	263	159	80	50	57	2,988	1
Management	22	299	541	739	805	837	618	464	310	126	42	20	4,823	9
Scientists	5	354	886	1,010	838	526	349	212	143	82	30	16	4,451	6
Technicians	20	201	378	547	493	365	165	114	68	47	7	20	2,425	25
Service	12	175	240	330	297	207	147	102	64	57	18	39	1,688	2
Agriculture		1	2	1	3	4		2					13	
Construction	11	115	203	193	175	114	66	32	26	20	1	6	962	4
Production	5	64	153	261	272	220	150	77	59	32	7	1	1,301	26
Transportation		2	15	22	21	15	14	5	3	3	2		102	
Laborers	12	20	46	61	65	63	40	38	8	5		5	363	3
Miscellaneous	29	98	94	93	88	56	29	24	22	10	13	77	633	
Total Persons	185	1,598	2,930	3,712	3,507	2,831	1,918	1,333	862	462	170	241	19,749	
Total Person-rem	0	6	9	12	15	10	11	6	3	4	0	0	77	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.279
Distribution of Persons Receiving Leg and Foot Dose by Age and Occupation (a)
1990 - Unknown Sex

Occupation	Number of Persons Receiving Radiation Doses in Each Age Range											Total Persons	Total Person-rem	
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown
Unknown	1	2	6	12	6	8	4	4	5	2	78	2,159	2,287	37
Scientists			2							-		23	25	
Technicians												4	4	
Service												27	27	
Construction		1		1						1		579	582	
Laborers												2	2	
Miscellaneous	13	8	6	1	1				1	1		263	294	
Total Persons	14	11	14	14	7	8	4	4	6	4	78	3,057	3,221	
Total Person-rem	0	0	0	0	0	0	0	0	0	0	2	35		37

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.280
Distribution of Collective Leg and Foot Dose by Age and Occupation (a)
1990 - Male

Occupation	Collective Dose Equivalent in Each Age Range											Total Person-rem			
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65		Unknown		
Unknown		1	2	3	2	2	1	1					13	12,969	
Management			3	5	6	8	6	4	4	3	1		40	8,267	
Scientists			6	6	11	8	5	8	8	5	1		58	25,927	
Technicians		4	17	39	30	16	12	10	15	7	1		-	150	9,469
Service			3	2	3	2	1	1	1				14	5,833	
Agriculture														109	
Construction		1	3	16	20	33	18	19	13	5			128	13,084	
Production		2	22	42	43	42	33	25	23	9	1		242	7,101	
Transportation				1	1	1	1	1	3				9	2,130	
Laborers			2	5	8	3	3	1	1				22	1,724	
Miscellaneous				3	2	2	2	2	3	1			15	3,439	
Total Person-rem	0	9	57	121	126	116	82	73	71	31	5	0	692		
Total Persons	322	3,594	9,272	13,737	14,652	13,768	10,418	8,686	7,310	4,921	1,820	1,552	90,052		

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.281
Distribution of Collective Leg and Foot Dose by Age and Occupation^(a)
1990 - Female

Occupation	Collective Dose Equivalent in Each Age Range											Total Person-rem		
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65		Unknown	
Unknown			1										1	2,988
Management			2	1	1	1	2	2					9	4,823
Scientists			1	2	1		1		1				6	4,451
Technicians		3	3	4	4	4	3	1		2			25	2,425
Service													2	1,688
Agriculture														13
Construction				1	1								4	962
Production		2	2	3	7	4	4	2	2				26	1,301
Transportation														102
Laborers					1	1							3	363
Miscellaneous														633
Total Person-rem	0	6	9	12	15	10	11	6	3	4	0	0	77	
Total Persons	185	1,598	2,930	3,712	3,507	2,831	1,918	1,333	862	462	170	241		19,749

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.282
Distribution of Collective Leg and Foot Dose by Age and Occupation^(a)
1990 - Unknown Sex

Occupation	Collective Dose Equivalent in Each Age Range											Total Person-rem	Total Persons		
	≤ 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	≥ 65			Unknown	
Unknown												2	35	37	2,287
Scientists															25
Technicians															4
Service															27
Construction															582
Laborers															2
Miscellaneous															294
Total Person-rem	0	0	0	0	0	0	0	0	0	0	0	2	35	37	
Total Persons	14	11	14	14	7	8	4	4	6	4	78	3,057		3,221	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.283
Distribution of Persons Receiving Leg and Foot Dose by Occupation and Facility Type^(a)
1990 - Male

Facility Type	Unknown	Management	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer	Misc.	Total Persons	Total Person-rem
Accelerator	1,164	131	2,021	1,402	122	17	139	100	34	1	175	5,306	41	
Fuel/Uran. Enrichment	244	790	1,146	512	343	1	1,019	782	46	177	59	5,119	22	
Fuel Fabrication	33	254	835	238	135		904	256	41	85	20	2,801	1	
- Fuel Processing	8	334	1,340	190	43	1	472	611	42	23	28	3,092	11	
Maint. and Support	4,412	1,939	3,045	1,277	1,311	25	7,179	1,147	723	829	49	21,936	127	
Reactor	21	753	2,285	545	130		640	712	85	61	379	5,611	59	
Research, General	2,959	917	5,651	1,904	549	9	505	346	57	110	1,727	14,734	110	
Research, Fusion	115	77	443	216	48		104	32		1	36	1,072		
Waste Proc./Management	109	563	1,434	655	174		733	482	160	55	39	4,404	95	
Weapons Fab. & Test.	2,082	1,690	3,731	1,741	840		1,037	2,367	405	242	99	14,234	212	
Other	1,822	819	3,996	789	2,138	56	352	266	537	140	828	11,743	14	
Total Persons	12,969	8,267	25,927	9,469	5,833	109	13,084	7,101	2,130	1,724	3,439	90,052		
Total Person-rem	13	40	58	150	14	0	128	242	9	22	15	692		

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.284
Distribution of Persons Receiving Leg and Foot Dose by Occupation and Facility Type^(a)
1990 - Female

Facility Type	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Occupation	Transport	Laborer	Misc.	Total Persons	Total Person-rem
Accelerator	169	71	226	101	41	4	4	4			7	623	2
Fuel/Uran. Enrichment	71	464	217	169	81	43	97	33	3	33	18	1,196	3
Fuel Fabrication	8	154	214	88	23	41	85	3	3	19	2	637	
Fuel Processing	1	186	240	57	29	45	197	3	3	1	1	760	1
Maint. and Support	1,107	1,491	705	620	272	640	140	46	205	15	15	5,241	15
Reactor	3	163	171	63	21	36	131	2	4	25	619	5	5
Research, General	775	502	862	536	113	2	36	1	17	353	3,213	11	11
Research, Fusion	12	29	29	15	6	2				2	95		
Waste Proc./Management	19	228	208	195	195	35	139	14	4	9	1,046	19	19
Weapons Fab. & Test.	510	1,020	750	380	147	97	440	10	55	26	3,435	20	20
Other	313	515	829	201	760	11	32	20	25	175	2,884	2	2
Total Persons	2,988	4,823	4,451	2,425	1,688	13	962	1,301	102	363	633	19,749	
Total Person-rem	1	9	6	25	2	0	4	26	0	3	0	77	77

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.285
Distribution of Persons Receiving Leg and Foot Dose by Occupation and Facility Type^(a)
1990 - Unknown Sex

Facility Type	Number of Persons Receiving Radiation Doses in Each Occupation											Total Persons-rem
	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer	Misc.	
Accelerator	2		11	3	1		1					18
Fuel/Uran. Enrichment	32											32
Maint. and Support					3		581		1			585
Research, General	6		12		1					158		177
Weapons Fab. & Test.	872				22				1		1	896
Other	1,375		2	1						135		1,513
Total Persons	2,287	0	25	4	27	0	582	0	0	2	294	3,221
Total Person-rem	37	0	0	0	0	0	0	0	0	0	0	37

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.286
Distribution of Collective Leg and Foot Dose by Occupation and Facility Type^(a)
1990 - Male

Facility Type	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Occupation	Production	Transport	Laborer	Misc.	Total Person-rem	Total Persons
Accelerator			9	25			1	2	4				41	5,306
Fuel/Uran. Enrichment	2	2	2	1	1		6	8					22	5,119
Fuel Fabrication													1	2,801
Fuel Processing		1						10					11	3,092
Maint. and Support		7	6	22	9		51	14	2	16			127	21,936
Reactor		4	6	9			23	16					59	5,611
Research, General	3	5	21	51	1		17	11	1				110	14,734
Research, Fusion														1,072
Waste Proc./Management		8	8	21			15	41	1				95	4,404
Weapons Fab. & Test.	4	11	4	15	2		14	140	1	5	15		212	14,234
Other	4	2	2	5			1						14	11,743
Total Person-rem	13	40	58	150	14	0	128	242	9	22	15		692	
Total Persons	12,969	8,267	25,927	9,469	5,833	109	13,084	7,101	2,130	1,724	3,439		90,052	

(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.287
Distribution of Collective Leg and Foot Dose by Occupation and Facility Type^(a)
1990 - Female

Facility Type	Collective Dose-Equivalent in Each Occupation											Total Person-rem		
	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer	Misc.			
Accelerator													2	623
Fuel/Uran. Enrichment		1											3	1,196
Fuel Fabrication														637
Fuel Processing								1					1	760
Maint. and Support		2		6	1		1	4		1			15	5,241
Reactor				2				3					5	619
Research, General	1	1	4	4				1					11	3,213
Research, Fusion														95
Waste Proc./Management		3	1	6				10					19	1,046
Weapons Fab. & Test.		2	1	5			2	8		2			20	3,435
Other				1									2	2,884
Total Person-rem	1	9	6	25	2	0	4	26	0	3	0		77	
Total Persons	2,988	4,823	4,451	2,425	1,688	13	962	1,301	102	363	633		19,749	

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

TABLE D.288
Distribution of Collective Leg and Foot Dose by Occupation and Facility Type^(a)
1990 - Unknown Sex

Facility Type	* * * * * Collective Dose-Equivalent in Each Occupation * * * * *											Total Person-rem			
	Unknown	Management	Science	Technician	Service	Agriculture	Constr'n	Production	Transport	Laborer	Misc.				
Accelerator															18
Fuel/Uran. Enrichment	1														32
Maint. and Support															585
Research, General															177
Weapons Fab. & Test.	9														896
Other	27														1,513
Total Person-rem	37	0	0	0	0	0	0	0	0	0	0	0	0	0	37
Total Persons	2,287	0	25	4	27	0	582	0	0	2	294				3,221

^(a) Throughout this report there may be minor variations in collective dose-equivalent values because of rounding.

