CHAPTER 9 SPECIAL CIRCUMSTANCES

TABLE OF CONTENTS

Article **Page**

PART 1 CONTROL OF RADIOACTIVE MATERIALS IN WILSON HALL

911 General Requirement

Wilson Hall is an office building as well as a laboratory. Unlike many of the other buildings on the Fermilab site, it is open to the general public. Possibilities could exist for the exposure of visitors to radiation and radioactive materials in the building, as well as for the loss or theft of such materials. Therefore, more restrictive procedures for the control of radioactive material are applied to this building than to most other buildings on the site. It is the intent of the Fermilab Director to minimize the usage of radioactive material in this building to the extent possible.

1. Prior written approval from the SRSO is required before any radioactive material is brought into Wilson Hall, with the following exceptions:

   a. Class 1 radioactive material (Refer to Table 4-2 and Article 413.1)

   b. Check sources built into radiation survey meters

2. Long-term storage of radioactive materials in Wilson Hall is discouraged.

912 Radioactive Source Use in Wilson Hall

The design and construction details of all sources used at Fermilab must be reviewed and approved by the ES&H Section. All requirements pertaining to the use of sources apply to those used in Wilson Hall (see Chapter 4, Part 3). Because of the nature of activities conducted in this building, source activities are limited. Table 9-1 gives Wilson Hall limits for some common radionuclides.

Table 9-1 Wilson Hall Limits for Common Radionuclides

Common Radionuclides	Wilson Hall Limit
^{241}Am, ^{244}Cm, ^{226}Ra	0.1 mCi
^{137}Cs, ^{60}Co, ^{22}Na, ^{65}Zn, ^{207}Bi, ^{54}Mn	1 mCi
^{55}Fe, ^{106}Ru, ^{90}Sr, ^{109}Cd	10 mCi

913 Use of Other Radioactive Materials in Wilson Hall

1. Radioactivity Class 2 and 3 items (see Article 413) shall be tagged to indicate their presence has been approved by the SRSO. Written records of the location of each object must be maintained by the responsible division or section.

2. Class 4 and 5 items will not be approved for use in Wilson Hall.

3. Uranium, transuranic elements, radioactive gases and radioactive liquids will generally not be approved unless packaged in a sealed, rugged container and prior written approval from the SRSO is obtained.

914 Contamination Limits in Wilson Hall

Because of the possibility of surface contamination, sample changer wipe test results must accompany all applications for approval to bring the following into Wilson Hall:

1. Class 2 or 3 items

2. Items from a target box, target train, etc.

3. Any items from an area known or suspected of having contamination levels exceeding those specified in Table 2-2.

Upper limits on the quantity of removable radioactivity for the item to be allowed entry in Wilson Hall are stated in Table 2-2.

915 Storage and Handling of Radioactive Material in Wilson Hall

1. All radioactive material must be stored and used in a manner such that the maximum dose rate in areas occupied by nonradiation workers for two or more hours per day or in areas frequented by the public does not exceed 0.05 mrem/hr.

2. The exposure rate at any location in which people do not normally stay for more than two hours per day, but which is open to nonradiation workers or to the general public, shall not exceed 0.1 mrem/hr. During movement of radioactive materials or other temporary situations, this level may be exceeded if surveillance is exercised to avoid excessive exposures to nonradiation workers.

3. No machining, cutting, grinding or welding on radioactive material is permitted in Wilson Hall without prior written approval of the SRSO**.**

4. All radioactive items not in use must be stored in a designated area. These storage areas must be posted with “Caution - Radioactive Material” signs at their entrances or boundaries and must be locked when unattended. If the exposure rate exceeds 5 mR/hr at 30 cm (1ft), “Caution - Radiation Area” signs are

required as well. For sources and small items, this storage area can be a locked storage cabinet. For large or heavy items, it may be the working area itself.

PART 2 SPECIAL OCCUPATIONAL EXPOSURES

921 Planned Special Exposures

1. A planned special exposure may be authorized for a radiological worker to receive doses in addition to and accounted for separately from the doses received under the limits specified in Table 2-1, provided each of the following conditions is satisfied:

    a. The planned special exposure is considered only in an exceptional situation when alternatives that might prevent a radiological worker from exceeding the established limits are unavailable or impractical. Such planned special exposures are highly discouraged at Fermilab and are anticipated to be extremely rare. Since such exposures are, prudently, rare or nonexistent at Fermilab, in event that they do occur, 10 CFR 835.204 should be consulted for detailed requirements.

    b. Fermilab management and the employee's management (for non-Fermilab employees) have specifically requested, in writing, the planned special exposure.

    c. The request has been reviewed by the SRSO and submitted by the Fermilab Laboratory Director or designee to the DOE for approval.

    d. Written approval from the Secretarial Official responsible for environment, safety and health matters and the appropriate DOE Headquarters program office has been obtained.

2. Prior to requesting an individual to participate in an authorized planned special exposure, the individual's dose from all previous planned special exposures and all doses in excess of the occupational dose limits shall be determined. An individual shall not participate if the sum of all previous planned special exposures, exposures in excess of the occupational dose limits and the estimate for this planned special exposure would result in:

    a. exceeding any of the numeric values for limits established in Table 2-1; and/or

    b. for the individual’s lifetime, exceeding 5 times the numeric values for limits established in Table 2-1.

3. Prior to a planned special exposure, written consent shall be obtained from each individual involved and the following documented:

   a. The purpose of the planned operations and procedures to be used;

   b. The estimated doses and associated potential risks and specific radiological conditions and other hazards which might be involved; and

   c. The measures to be taken to keep the dose ALARA considering other risks that may be present.

4. Records of the written request for a planned special exposure and the appropriate consent and approvals shall be maintained by the ES&H Section. A written report shall be submitted within 30 days after the exposure to the SRSO, the Laboratory Director, the Secretarial Official responsible for environment, safety and health matters and the appropriate DOE Headquarters program office.

5. The dose from planned special exposures is not to be considered in controlling future occupational dose of the individual, but must be included in the individual's exposure history and reported under the requirements of Article 781.

922 Emergency Exposures

In extremely rare cases, emergency exposure to radiation may be necessary to rescue personnel or to protect major property. Emergency exposures may be authorized in accordance with the provisions contained in 10 CFR 835. These doses are in addition to and accounted for separately from the doses received under the limits in Table 2-1. Emergency exposures are not classified as Planned Special Exposures. Prior to incurring any emergency exposure:

1. The risk of injury to those individuals involved in rescue and recovery operations shall be minimized.

2. Operating management shall weigh actual and potential risks to rescue and recovery individuals against the benefits to be gained.

3. Each individual selected shall be trained at a minimum as a Radiological Worker (Article 622) and briefed beforehand of the known or anticipated hazards to which the individual will be subjected. Rescue operations that involve substantial personal risk shall be performed by volunteers.

4. No individual shall be required to perform rescue action that might involve substantial personal risk.

The dose guidelines for personnel performing these operations are provided in Table 9-2.

Table 9-2 Guidelines for Control of Emergency Exposures

DOSE LIMIT[1,2] (Whole Body)	ACTIVITY PERFORMED	CONDITIONS
5 rem	All	As determined by Emergency Official in charge
10 rem	Protecting major property	Where lower dose limit not practicable
25 rem	Lifesaving or protection of large populations	Where lower dose limit not practicable
>25 rem	Lifesaving or protection of large populations	Only on a voluntary basis to personnel fully aware of the risks involved

Notes to Table 9-2:

1. The dose limit to the lens of the eye should be three times the listed values.

2. The dose limit to the skin of the whole body and the extremities is ten times the listed values.

PART 3 CONTROLLING DOSES TO MINORS

931 Exposure Control Procedures for Minors

The NCRP in Report #32 recommends that minors, individuals under the age of 18, not receive any occupational exposure. Although this is highly discouraged at Fermilab, it is conceivable that a minor may be exposed to radiation and radioactive materials while working at Fermilab. The occupational dose limit to minors, individuals under the age of 18, is established in Article 212. NOTE: Non-occupational exposures of minors are addressed in Article 941. Although possible, a minor could receive the maximum permissible occupational exposure in additional to the maximum visitor dose. However, the summation is still well below the most recent recommendations of scientific bodies for exposures that do not occur repeatedly. To ensure that the occupational dose limit is not exceeded, Fermilab has implemented the following procedure for the entry of persons under the age of 18 into posted radiological areas:

1. The prior approval of the SRSO is needed before persons under 18 years of age are allowed to enter any radiological area.

2. Persons under 18 years of age are not permitted to enter any radiation areas where the dose rate exceeds 10 mrem/hr, nor are they allowed to enter any area where contamination is known to be present.

3. A personnel monitoring dosimetry badge, which is the dosimeter of record at Fermilab, should not be issued to minors, unless there is the potential for the individual to receive more than 50 mrem in the calendar year or the radiological posting(s) of the area(s) to be entered require one and all approvals have been obtained. The Area RSO may deem it prudent to issue the individual a pocket dosimeter to estimate the dose received during the period of employment.

PART 4 POLICIES FOR ON SITE VISITORS

941 General

This Part only addresses issues pertaining to radiological hazards. In addition to radiation and radioactive materials, there are many other hazards (addressed in Chapter 11010 of the Fermilab ES&H Manual) which a visitor may encounter. As such, it is highly recommended that all visitors be escorted in experimental and/or operational areas.

1. Prior approval of the division/section RSO is required before entry by visitors or untrained personnel into any area posted for radiological purposes including Radioactive Materials Areas and Radiological Areas. If the visitor is a minor or if the visitor has the potential to receive a dose in excess of 10 mrem, prior approval of the SRSO is also required. Visitors are prohibited from entering Very High Radiation Areas, Contamination Areas, High Contamination Areas and Airborne Radioactivity Areas.

2. Visitors must be escorted by an individual who satisfies all entry requirements into the area and is cognizant of any unsafe or unusual conditions in the area.

3. Visitors should receive an radiological orientation commensurate with the areas to be visited addressing the topics listed below:

   a. Basic radiation protection concepts
   b. Risk of low-level radiation exposure, including cancer and genetic effects
   c. Risk of prenatal radiation exposure
   d. Relevant radiological protection policies and procedures for the areas they will visit
   e. Visitor and management responsibilities for radiation safety
   f. Radiological posting and labeling
   g. Applicable emergency procedures
   h. Training in the use of the personnel monitoring dosimetry badge and/or pocket dosimeters, if required.

This information may be communicated by handout, preferably the pamphlet entitled RADIATION SAFETY INFORMATION FOR VISITORS, to individuals expected to enter such locations. Records of such orientation should be maintained by the division/section sponsoring the visit.

4. A personnel monitoring dosimetry badge, which is the dosimeter of record at Fermilab, should not be issued to visitors, unless there is the potential for the individual to receive more than 50 mrem on his/her visit or the radiological posting(s) of the area(s) requires a dosimeter to be worn. The temporary badge card shall indicate the areas visited.

PART 5 PRENATAL POLICY/PROCEDURES

951 Prenatal Policy and Procedures

Members of the Radiological Control Organization will make themselves available to answer questions and concerns regarding prenatal radiation exposure raised by any radiological worker. In addition, they will provide assistance in implementing prudent measures to minimize exposure of the unborn child. The requirements of this Article pertain only to Fermilab employees. To learn of options available to them, female employees of subcontractors or other institutions should contact their own employer. As appropriate, the following may be used as guidelines in outlining a course of action for employees of subcontractors or other institutions.

Fermilab has established a policy and appropriate procedures to allow a radiation worker to make a knowledgeable decision regarding the risk to her unborn child. Once a woman has been classified as a declared pregnant worker, the dose limit of 500 mrem to the embryo/fetus for the entire gestation period established in Article 213 applies.

If a woman knows or suspects that she is pregnant, she must choose one of the following options:

1. Choose not to notify the Medical Department in writing of her pregnancy. In this case, the usual occupational exposure limits will continue to be applied. Women who take this option should only do so with full awareness that they may be increasing the risk to their unborn child.

2. Voluntarily notify the Medical Department in writing as soon as possible. The documentation of declarations of pregnancy can be made on R. P. Form # 86 and distributed as stated on the form. At any time, the worker may, in writing, revoke this declaration.

    a. After a female radiological worker voluntarily notifies Fermilab in writing that she is pregnant, she is considered a declared pregnant worker for the purpose of fetal/embryo dose protection. At this time, a radiation safety staff member will measure radiation levels in her work area(s) and estimate the exposure to the unborn child for the term.

b. After this evaluation is conducted, a Fermilab employee has the following options:

1) Request a temporary reassignment to work in areas involving a lower potential for radiation exposure. If a transfer is recommended by the Medical Department and radiation safety, Fermilab shall make a reasonable attempt to find an assignment of equal pay and status for the employee.

2) Ask for a leave of absence. Leaves of absence under such circumstances are subject to the requirements of the Personnel Policy Guide.

3) Continue working at the same job assignment and reducing her dose to less than 500 mrem throughout the duration of the pregnancy, where practical, by using shielding, increasing distances from radiation sources and decreasing the amount of time spent in radiation areas. Fermilab radiation safety personnel shall make recommendations to the woman's supervisor such that reasonable steps can be taken to minimize her radiation exposure.

4) Terminate employment at the Laboratory.

The option selected shall be documented and dated in writing and retained by the Medical Department.

c. To learn options available to them, female users should contact the administrator of their sponsoring institution and female subcontractor employees should contact their own employer.

3. Declared pregnant worker:

a. If the dose to the embryo/fetus is determined to have already exceeded 500 mrem when a worker notifies her employer of her pregnancy, the worker shall not be assigned to tasks where additional occupational exposure is likely for the duration of her pregnancy.

b. Efforts shall be made to avoid exceeding 50 mrem per month to the pregnant radiological worker. The worker shall be assigned a pocket dosimeter and wear it while working in controlled areas in order to monitor her dose on a monthly basis.

c. Fermilab's dosimetry vendor offers the option of an additional badge for fetal monitoring. Pregnant workers who frequently work in non-uniform fields or in close proximity to radioactive materials such that the fetal dose

might differ significantly from the pregnant worker's whole body dose are encouraged to use this option.

PART 6 OTHER CONSIDERATIONS TO PERFORM RADIOLOGICAL WORK

961 Temporary Disabilities

Temporary disabilities, such as fractures, sprains or cuts, may impair a radiological worker's ability to conduct his/her work in a manner that is ALARA or may require additional protective measures to be taken. Each situation should be evaluated separately by the radiological worker and his/her supervisor. Often the work can be postponed or it can be reassigned to another individual. The Area RSO or designee should be consulted when the decision is made to continue with the work to ensure the protective measures employed are commensurate with the hazard.

962 Medical Exposures

On occasion, a radiological worker may undergo a medical procedure involving the administration of radioactive materials. Although radiological workers are not required to inform the Medical Department or the Radiological Control Organization (RCO), it is highly recommended. Doses from such procedures are not to be included in one's occupational exposure history record. In addition, the radioactivity within the body may interfere with the conduct of radiation surveys of equipment and persons. For these reasons, reporting such a procedure is encouraged. R.P. Forms #88 and #91 should be used to document such exposures.

1. A radiological worker who has received a nuclear medicine procedure should inform the Medical Department, the Area Radiation Safety Officer (RSO) or the ES&H Section Dosimetry Program Manager. The individual should be instructed to complete R.P. Form #88, Medical Procedures Involving Radioactive Material.
2. The completed R.P. Form #88 should be forwarded to the Dosimetry Program Manager. The Dosimetry Program Manager shall inform the Area RSO if they have not already been notified.
3. The Area RSO should complete R.P. Form #91, Area RSO Checklist for Radiation Workers Who Have Undergone a Nuclear Medicine Procedure.
4. Upon receipt of R.P. Form #88, the Dosimetry Program Manager should take appropriate steps to ensure that the issued personnel monitoring dosimetry badge was not worn during or immediately after the procedure. If the badge was worn, the badge should be sent to the vendor for processing and an exposure investigation initiated (Articles 572 and 573). The completed R.P. Form #88 should be retained in the individual's exposure history file.
5. The affected individual should be instructed to contact his/her Area RSO upon returning to work.
6. The Area RSO or designee should supervise a personnel frisk using an approved instrument.

a. If the no radioactivity above background can be detected then the person can be released to perform radiological work.
b. If levels exceed background, the individual should be restricted from radiological work until levels return to background. Depending upon the isotope and activity administered, this could be from one day to four or more weeks. The individual's immediate supervisor should be notified of this restriction to allow temporary accommodations to be made.

7. The Area RSO should visit the individual's workbench/desk area to ensure the prevailing dose rates are below 0.25 mrem/hour the majority of the workday, and check dose rates if necessary.

8. Waste materials (paper products and chewing gum, in particular) may be contaminated after use. Care must be taken to isolate these materials by placing them in temporary storage or having the employee take the materials home for disposal. The Area RSO or designee should make the appropriate arrangements.