

CONGRATULATIONS!

Please read the following materials then, if you wish to declare your pregnancy, complete the RS-13 form.

Return the completed form to:

Dosimetry
Radiation Safety
EHS – room 103
1314 Kinnear Road
The Ohio State University
Columbus, Ohio 43212

If you have any questions, after reading the following material, please contact Radiation Safety at radiation.safety@osu.edu or 292-4763.

Contents

- ☐ *Radiation Standards for The Ohio State University*, Section 6 – selected excerpts
- ☐ *Radiation Protection for the Pregnant Worker* by Nexus (for x-ray workers)
- ☐ *Instructions Concerning Prenatal Exposure by the United States Nuclear Regulatory Commission*

VI. PERSONNEL MONITORING PROGRAMS

Excerpts from section 6 of the Radiation Safety Standards for The Ohio State University for pregnant workers:

A.

1. Requirements for Individual Monitoring Devices (Badges)

In order to detect and evaluate exposure to external radiation, individual monitoring devices will be issued to individuals who are likely to receive, in one year from sources external to the body, a dose in excess of 10 percent of the applicable limits. The limits are:

	Dose Limit (rem/year)
<u>Adult Worker</u>	
Total Effective Dose Equivalent	5
Total Organ Dose Equivalent	50
Lens of Eye	15
Extremities/Skin	50
<u>Embryo/Fetus</u>	
Declared Pregnant Worker	Total Effective Dose Equivalent 0.5 rem per 9 months
<u>Minor</u>	
< 18 years of age	10% of Adult Limits

2. Pregnant Workers

A pregnant radiation worker may voluntarily declare her pregnancy in writing to the Radiation Safety Section of EHS (see Form and Instructions for RS-13, Declaration of Pregnancy). Radiation Safety will review the RS-13 form and recommend a personnel monitoring program based on the information supplied on the Declaration of Pregnancy form. Upon declaration of pregnancy, the radiation dose to the embryo/fetus during the entire pregnancy will not be allowed to exceed 0.5 rem Total Effective Dose Equivalent (TEDE).

5. Other Badge Requirements

Some individual monitoring devices are issued due to license conditions apart from the Ohio Administrative Code. Therefore, the following requirements are noted:

- a. Minors and declared pregnant workers when there is a reasonable possibility for measurable exposure. This includes working in a room where radioactive materials detectable with a dosimeter are being used.

6. Obtaining Dosimeters

- a. If an individual is joining a laboratory group already supplied with dosimeters, a copy of a badge requisition (RS-10) can be obtained from the Approved Supervisor. The form must be completed, signed, and returned to Radiation Safety. Upon receipt of the completed requisition, and attendance at the OSU Radiation Safety Short Course, a temporary badge can be assigned until the permanent badge has been received.
- b. If an individual or group needs to initiate dosimeter service, contact Radiation Safety for the appropriate forms.

7. More Information Relating to Dosimeters

- a. Store dosimeters where they will not inadvertently be exposed to radiation, excessive heat or moisture. Badges should only be kept at work, never taken home.
- b. Wear only the dosimeter(s) assigned to you.
- c. Wear the whole body badge on the trunk of your body, at the point where it is most likely to receive maximum exposure. Be consistent in wearing the badges on the same area of the body.
- e. If wearing a lead apron, wear the badge on your collar, outside of the apron. If you have two dosimeters, then the whole body badge is worn under the lead apron and the second dosimeter (designated as a collar badge type) should be worn on your collar outside of the apron.
- f. If appropriate, declared pregnant workers will be issued a fetal dosimeter, along with their whole body dosimeter, for the duration of their pregnancy.
- g. Dosimeters are exchanged the first day of each calendar quarter (i.e. January 1, April 1, July 1 and October 1). Upon receipt of the new dosimeters, immediately turn in the previous dosimeters to your Approved Supervisor or the designated badge group leader.
- i. Do not wear your dosimeter when you undergo medical exams or therapies which involve radiation exposure. This includes medical and dental x-rays.
- j. If you suspect that you or your dosimeter may have been overexposed or contaminated, call Radiation Safety immediately.

RADIATION PROTECTION FOR THE PREGNANT WORKER

A candid interview with Stewart C. Bushong, Sc.D., Professor of Radiologic Science, Baylor University, College of Medicine

Editor's Note: Since the publication of this article, regulations have been enacted requiring that dose to the embryo/fetus of declared pregnant workers not exceed 500 mrem over the entire pregnancy. See Title 10 Part 20 of the Code of Federal Regulations or Landauer's Nexus on the new 10CFR20 for details.

Nexus: It is reported to us from time to time that a pregnant radiation worker was furloughed or dismissed from her job because the employer became concerned over possible radiation injury to the unborn child. Is this proper procedure?

Dr. Bushong: Absolutely not. There are a number of protective devices and administrative procedures to ensure that no harm will come to the unborn.

Nexus: Is there a safe dose to which a pregnant worker can be exposed?

Dr. Bushong: There is an easy response to that question, but the true situation is much more complicated. The easy response is that the maximum permissible dose (MPD)—5 mSv (500 mrad) during pregnancy—is safe.

Nexus: Is this radiation level, 5 mSv for nine months, considered an absolutely safe level of radiation?

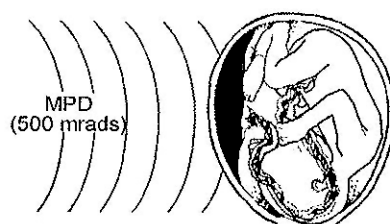
Dr. Bushong: Simplistically, yes. But since we know that some possible radiation effects on the fetus are nonthreshold, there is theoretically a vanishingly small probability of response following even lower radiation levels.

Nexus: What do you mean by a nonthreshold type of effect?

Dr. Bushong: Let's first consider a threshold type effect. Death, following a single high exposure to radiation, is a threshold type effect. At doses less than approxi-

mately 2 Gy (200 rads) no one will die; therefore, 2 Gy is said to be the threshold dose for radiation-induced acute lethality.

Radiation-induced leukemia responds in a nonthreshold fashion. If a large population were to receive a 2 Gy dose, a small percentage of that population, less



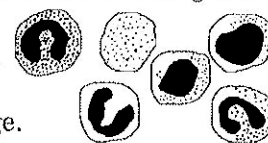
than 5%, would develop leukemia several years later. Following 1 Gy, approximately half of that percentage would develop leukemia. Following even lower doses, a proportionately lower percentage would be expected to develop leukemia. At doses in the occupational exposure range, there is a statistically predictable level of radiation-induced leukemia. However, it is so small that it is not measurable.

Nexus: So even radiation doses less than the MPD have a probability of producing an effect?

Dr. Bushong: Yes, but the probability is so very, very small that even if all pregnant workers received the MPD, no injury to any unborn child would be expected.

Nexus: Can you be more specific? First, tell us what radiation responses are we talking about?

Dr. Bushong: There are basically two. Radiation-induced malignant disease, leukemia and cancer, and genetic change.



Nexus: What about congenital abnormalities?

Dr. Bushong: That type of response to radiation is a threshold type effect and certainly does not occur at doses in the range of the MPD.

Nexus: Then, for example, what is the risk of a newborn developing a childhood malignancy following exposure to the MPD?

Dr. Bushong: To the best of our knowledge, the absolute risk of radiation-induced cancer and leukemia in adults is approximately 30 cases in a population of 1 million, each of whom has received a dose of 1 cGy (1 rad); therefore, following 5 mGy (500 mrad) to 1 million persons, one would expect 15 cases or 1.5 cases per 100,000. That estimate is for adults receiving an abrupt exposure, not one that is extended over time such as that which we receive occupationally. It is, therefore, a worst case estimate. To worsen the estimate further, let's assume that the entire MPD was received during the first trimester of pregnancy when the risk is approximately ten times higher. Therefore, one might expect as many as 15 cases in 100,000. The total number of active radiologic technologists is approximately

100,000, certainly less than 1% of whom would be pregnant at any time, so that the excess risk of such a harmful effect is only about 1/10th of a case.

Nexus: You mentioned genetic effects.

Dr. Bushong: The probability of a harmful genetic effect is only about 1/10th that for malignant disease and, therefore, it is of even less concern.

Nexus: So if you consider the MPD to be a safe dose, what dose is considered to be dangerous?

Dr. Bushong: Let's use the example of a patient who has been exposed to diagnostic x-rays during pregnancy. If the exposure occurred during the first trimester, we would not recommend an alteration in the pregnancy at doses less than about 10 cGy (10 rads). Late in pregnancy, the safe dose rises to approximately 25 cGy (25 rads).

Nexus: Okay, you indicate that the MPD is a safe dose so therefore protective measures are not necessary. Right?

Dr. Bushong: Wrong. Because some responses of the fetus to radiation are nonthreshold in nature, it is important that we reduce the fetal dose as low as possible.

Nexus: How do we do this? Through the use of the devices and administrative procedures you mentioned earlier?

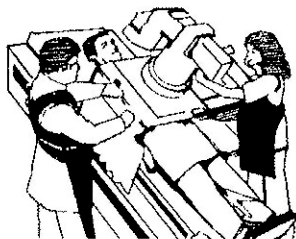
Dr. Bushong: Yes. And, perhaps we could consider the largest population of potentially pregnant radiation workers, radiologic technologists, as an example.

Nexus: What protective devices can be employed?

Dr. Bushong: The principal protective device is one that is routinely used anyway, the lead apron. A radiologic technologist receives nearly all occupational exposure during fluoroscopy and portable radiography where protective aprons are used. These aprons do just what they are designed to do—reduce the radiation dose to near zero.

Nexus: Can you be more specific?

Dr. Bushong: Very few radiologic technologists will exceed an occupational exposure of 1 cSv (1 rem) in a nine-month period as recorded by a radiation monitor positioned at collar level above



the protective apron. Most will get less than half of that, but for simplicity let's assume 1 cSv (1 rem). The dose to the abdomen under the protective apron will be approximately 5% of the collar dose, or 500 μ Sv (50 mrem). Because of overlying maternal tissues, the dose to the fetus will be only about 1/4th of the abdominal entrance dose, or approximately 125 μ Sv (12.5 mrem). This is a vanishingly small exposure and certainly absolutely nothing to be concerned about.

Nexus: Can anything else be done?

Dr. Bushong: Yes. There are perhaps two other procedures that should be followed. If staffing permits, one could shift the pregnant employee from her normal position to a job with potentially lower exposure. For instance, the radiologic technologist could be assigned to radiography only, and removed from the fluoroscopy schedule and portable work. However, such a move is not

absolutely necessary, especially if temporary help would have to be employed to accommodate such a move.

Nexus: Anything else?

Dr. Bushong: Yes. You can provide the pregnant employee with an additional radiation monitor and instruct her to wear it at waist level under the protective apron. This monitor should be identified as "baby badge" or "fetal badge." This is not specifically a dose reduction measure, but rather to define more clearly the fetal dose that is actually received.

Nexus: So do we understand that there are no circumstances under which a pregnant employee should be terminated because of concern over her radiation exposure?

Dr. Bushong: None. Furthermore, there is no situation in which the pregnant employee should feel that she is placed at undue risk. That situation simply doesn't exist. With proper attention to routine radiation protection practices, the pregnant worker should not feel any more concern for her unborn than she does following the normal experiences and exposures of everyday life.

Stewart C. Bushong, Sc.D., received his B.S. in physics from the University of Maryland. He went on to spend four years as a nuclear reactor physicist for the U.S. Public Health Service and at Westinghouse Atomic Power Laboratory.

In 1966, he earned his Sc.D. at the University of Pittsburgh and joined the staff at Baylor University, College of Medicine. Currently, he holds the position of Professor of Radiologic Science in the school's Department of Radiology.

Bushong has authored more than 100 scientific papers and has written 10 books. One of his books, "Radiologic Science for Technologists," is the popular standard in x-ray technology training.



Regulatory Guide 8.13 - Instruction Concerning Prenatal Radiation Exposure

(Draft was issued as DG-8014)


Revision 3
June 1999

8/17/2010

A. INTRODUCTION

The Code of Federal Regulations in [10 CFR Part 19](#), "Notices, Instructions and Reports to Workers: Inspection and Investigations," in [Section 19.12](#), "Instructions to Workers," requires instruction in "the health protection problems associated with exposure to radiation and/or radioactive material, in precautions or procedures to minimize exposure, and in the purposes and functions of protective devices employed." The instructions must be "commensurate with potential radiological health protection problems present in the work place."

The Nuclear Regulatory Commission's (NRC's) regulations on radiation protection are specified in [10 CFR Part 20](#), "Standards for Protection Against Radiation"; and [Section 20.1208](#), "Dose to an Embryo/Fetus," requires licensees to "ensure that the dose to an embryo/fetus during the entire pregnancy, due to occupational exposure of a declared pregnant woman, does not exceed 0.5 rem (5 mSv)." [Section 20.1208](#) also requires licensees to "make efforts to avoid substantial variation above a uniform monthly exposure rate to a declared pregnant woman." A declared pregnant woman is defined in [10 CFR 20.1003](#) as a woman who has voluntarily informed her employer, in writing, of her pregnancy and the estimated date of conception.

 This regulatory guide is intended to provide information to pregnant women, and other personnel, to help them make decisions regarding radiation exposure during pregnancy. This Regulatory Guide 8.13 supplements [Regulatory Guide 8.29](#), "Instruction Concerning Risks from Occupational Radiation Exposure" (Ref. 1), which contains a broad discussion of the risks from exposure to ionizing radiation.

Other sections of the NRC's regulations also specify requirements for monitoring external and internal occupational dose to a declared pregnant woman. In [10 CFR 20.1502](#), "Conditions Requiring Individual Monitoring of External and Internal Occupational Dose," licensees are required to monitor the occupational dose to a declared pregnant woman, using an individual monitoring device, if it is likely that the declared pregnant woman will receive, from external sources, a deep dose equivalent in excess of 0.1 rem (1 mSv). According to Paragraph (e) of [10 CFR 20.2106](#), "Records of Individual Monitoring Results," the licensee must maintain records of dose to an embryo/fetus if monitoring was required, and the records of dose to the embryo/fetus must be kept with the records of dose to the declared pregnant woman. The declaration of pregnancy must be kept on file, but may be maintained separately from the dose records. The licensee must retain the required form or record until the Commission terminates each pertinent license requiring the record.

The information collections in this regulatory guide are covered by the requirements of [10 CFR Parts 19](#) or [20](#), which were approved by the Office of Management and Budget, approval numbers 3150-0044 and 3150-0014, respectively. The NRC may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

B. DISCUSSION



As discussed in [Regulatory Guide 8.29](#) (Ref. 1), exposure to any level of radiation is assumed to carry with it a certain amount of risk. In the absence of scientific certainty regarding the relationship between low dose exposure and health effects, and as a conservative assumption for radiation protection purposes, the scientific community generally assumes that any exposure to ionizing radiation may cause undesirable biological effects and that the likelihood of these effects increases as the dose increases. At the occupational dose limit for the whole body of 5 rem (50 mSv) per year, the risk is believed to be very low.

have been reported. The data from these studies "are consistent with a lifetime cancer risk resulting from exposure during gestation which is two to three times that for the adult" (NCRP Report No. 116, Ref. 2). The NRC has reviewed the available scientific literature and has concluded that the 0.5 rem (5 mSv) limit specified in [10 CFR 20.1208](#) provides an adequate margin of protection for the embryo/fetus. This dose limit reflects the desire to limit the total lifetime risk of leukemia and other cancers associated with radiation exposure during pregnancy.

In order for a pregnant worker to take advantage of the lower exposure limit and dose monitoring provisions specified in [10 CFR Part 20](#), the woman must declare her pregnancy in writing to the licensee. A form letter for declaring pregnancy is provided in this guide or the licensee may use its own form letter for declaring pregnancy. A separate written declaration should be submitted for each pregnancy.

C. REGULATORY POSITION

1. Who Should Receive Instruction

Female workers who require training under [10 CFR 19.12](#) should be provided with the information contained in this guide. In addition to the information contained in Regulatory Guide 8.29 (Ref. 1), this information may be included as part of the training required under 10 CFR 19.12.

2. Providing Instruction

The occupational worker may be given a copy of this guide with its Appendix, an explanation of the contents of the guide, and an opportunity to ask questions and request additional information. The information in this guide and Appendix should also be provided to any worker or supervisor who may be affected by a declaration of pregnancy or who may have to take some action in response to such a declaration.

Classroom instruction may supplement the written information. If the licensee provides classroom instruction, the instructor should have some knowledge of the biological effects of radiation to be able to answer questions that may go beyond the information provided in this guide. Videotaped presentations may be used for classroom instruction. Regardless of whether the licensee provides classroom training, the licensee should give workers the opportunity to ask questions about information contained in this Regulatory Guide 8.13. The licensee may take credit for instruction that the worker has received within the past year at other licensed facilities or in other courses or training.

3. Licensee's Policy on Declared Pregnant Women

The instruction provided should describe the licensee's specific policy on declared pregnant women, including how those policies may affect a woman's work situation. In particular, the instruction should include a description of the licensee's policies, if any, that may affect the declared pregnant woman's work situation after she has filed a written declaration of pregnancy consistent with [10 CFR 20.1208](#).

The instruction should also identify who to contact for additional information as well as identify who should receive the written declaration of pregnancy. The recipient of the woman's declaration may be identified by name (e.g., John Smith), position (e.g., immediate supervisor, the radiation safety officer), or department (e.g., the personnel department).

4. Duration of Lower Dose Limits for the Embryo/Fetus

The lower dose limit for the embryo/fetus should remain in effect until the woman withdraws the declaration in writing or the woman is no longer pregnant. If a declaration of pregnancy is withdrawn, the dose limit for the embryo/fetus would apply only to the time from the estimated date of conception until the time the declaration is withdrawn. If the declaration is not withdrawn, the written declaration may be considered expired one year after submission.

5. Substantial Variations Above a Uniform Monthly Dose Rate


According to 10 CFR 20.1208(b), "The licensee shall make efforts to avoid substantial variation above a uniform monthly exposure rate to a declared pregnant woman so as to satisfy the limit in paragraph (a) of this section," that is, 0.5 rem (5 mSv) to the embryo/fetus. The National Council on Radiation Protection and Measurements (NCRP) recommends a monthly equivalent dose limit of 0.05 rem (0.5 mSv) to the embryo/fetus once the pregnancy is known (Ref. 2). In view of the NCRP recommendation, any monthly dose of less than 0.1 rem (1 mSv) may be considered as not a substantial variation above a uniform monthly dose rate and as such will not require licensee justification. However, a monthly dose greater than 0.1 rem (1 mSv) should be justified by the licensee.

D. IMPLEMENTATION

The purpose of this section is to provide information to licensees and applicants regarding the NRC staff's plans for using this regulatory guide.

Unless a licensee or an applicant proposes an acceptable alternative method for complying with the specified portions of the NRC's regulations, the methods described in this guide will be used by the NRC staff in the evaluation of instructions to workers on the radiation exposure of pregnant women.

REFERENCES

1. USNRC, "Instruction Concerning Risks from Occupational Radiation Exposure," [Regulatory Guide 8.29, Revision 1](#) , February 1996.
2. National Council on Radiation Protection and Measurements, *Limitation of Exposure to Ionizing Radiation*, NCRP Report No. 116, Bethesda, MD, 1993.

APPENDIX: QUESTIONS AND ANSWERS CONCERNING PRENATAL RADIATION EXPOSURE

1. Why am I receiving this information?

The NRC's regulations (in 10 CFR 19.12, "Instructions to Workers") require that licensees instruct individuals working with licensed radioactive materials in radiation protection as appropriate for the situation. The instruction below describes information that occupational workers and their supervisors should know about the radiation exposure of the embryo/fetus of pregnant women.

The regulations allow a pregnant woman to decide whether she wants to formally declare her pregnancy to take advantage of lower dose limits for the embryo/fetus. This instruction provides information to help women make an informed decision whether to declare a pregnancy.

2. If I become pregnant, am I required to declare my pregnancy?

No. The choice whether to declare your pregnancy is completely voluntary. If you choose to declare your pregnancy, you must do so in writing and a lower radiation dose limit will apply to your embryo/fetus. If you choose not to declare your pregnancy, you and your embryo/fetus will continue to be subject to the same radiation dose limits that apply to other occupational workers.

3. If I declare my pregnancy in writing, what happens?

If you choose to declare your pregnancy in writing, the licensee must take measures to limit the dose to your embryo/fetus to 0.5 rem (5 millisievert) during the entire pregnancy. This is one-tenth of the dose that an occupational worker may receive in a year. If you have already received a dose exceeding 0.5 rem (5 mSv) in the period between conception and the declaration of your pregnancy, an additional dose of 0.05 rem (0.5 mSv) is allowed during the remainder of the pregnancy. In addition, 10 CFR 20.1208, "Dose to an Embryo/Fetus," requires licensees to make efforts to avoid substantial variation above a uniform monthly dose rate so that all the 0.5 rem (5 mSv) allowed dose does not occur in a short period during the pregnancy.

This may mean that, if you declare your pregnancy, the licensee may not permit you to do some of your normal job functions if those functions would have allowed you to receive more than 0.5 rem, and you may not be able to have some emergency response responsibilities.

4. Why do the regulations have a lower dose limit for the embryo/fetus of a declared pregnant woman than for a pregnant worker who has not declared?

A lower dose limit for the embryo/fetus of a declared pregnant woman is based on a consideration of greater sensitivity to radiation of the embryo/fetus and the involuntary nature of the exposure. Several scientific advisory groups have recommended (References 1 and 2) that the dose to the embryo/fetus be limited to a fraction of the occupational dose limit.

5. What are the potentially harmful effects of radiation exposure to my embryo/fetus?

The occurrence and severity of health effects caused by ionizing radiation are dependent upon the type and total dose of radiation received, as well as the time period over which the exposure was received. See Regulatory Guide 8.29, "Instruction Concerning Risks from Occupational Exposure" (Ref. 3), for more information. The main concern is embryo/fetal susceptibility to the harmful effects of radiation such as cancer.

6. Are there any risks of genetic defects?

Although radiation injury has been induced experimentally in rodents and insects, and in the experiments was transmitted and became manifest as hereditary disorders in their offspring, radiation has not been identified as a cause of such effect in humans. Therefore, the risk of genetic effects attributable to radiation exposure is speculative. For example, no genetic effects have been documented in any of the Japanese atomic bomb survivors, their children, or their grandchildren.

7. What if I decide that I do not want any radiation exposure at all during my pregnancy?

You may ask your employer for a job that does not involve any exposure at all to occupational radiation dose, but your employer is not obligated to provide you with a job involving no radiation exposure. Even if you receive no occupational exposure at all, your embryo/fetus will receive some radiation dose (on average 75 mrem (0.75 mSv)) during your pregnancy from natural background radiation.

The NRC has reviewed the available scientific literature and concluded that the 0.5 rem (5 mSv) limit provides an adequate margin of protection for the embryo/fetus. This dose limit reflects the desire to limit the total lifetime risk of leukemia and other cancers. If this dose limit is exceeded, the total lifetime risk of cancer to the embryo/fetus may increase incrementally. However, the decision on what level of risk to accept is yours. More detailed information on potential risk to the embryo/fetus from radiation exposure can be found in References 2-10.

8. What effect will formally declaring my pregnancy have on my job status?

Only the licensee can tell you what effect a written declaration of pregnancy will have on your job status. As part of your radiation safety training, the licensee should tell you the company's policies with respect to the job status of declared pregnant women. In addition, before you declare your pregnancy, you may want to talk to your supervisor or your radiation safety officer and ask what a declaration of pregnancy would mean specifically for you and your job status.

In many cases you can continue in your present job with no change and still meet the dose limit for the embryo/fetus. For example, most commercial power reactor workers (approximately 93%) receive, in 12 months, occupational radiation doses that are less than 0.5 rem (5 mSv) (Ref. 11). The licensee may also consider the likelihood of increased radiation exposures from accidents and abnormal events before making a decision to allow you to continue in your present job.

If your current work might cause the dose to your embryo/fetus to exceed 0.5 rem (5 mSv), the licensee has various options. It is possible that the licensee can and will make a reasonable accommodation that will allow you to continue

performing your current job, for example, by having another qualified employee do a small part of the job that accounts for some of your radiation exposure.

9. What information must I provide in my written declaration of pregnancy?

You should provide, in writing, your name, a declaration that you are pregnant, the estimated date of conception (only the month and year need be given), and the date that you give the letter to the licensee. A form letter that you can use is included at the end of these questions and answers. You may use that letter, use a form letter the licensee has provided to you, or write your own letter.

10. To declare my pregnancy, do I have to have documented medical proof that I am pregnant?

NRC regulations do not require that you provide medical proof of your pregnancy. However, NRC regulations do not preclude the licensee from requesting medical documentation of your pregnancy, especially if a change in your duties is necessary in order to comply with the 0.5 rem (5 mSv) dose limit.

11. Can I tell the licensee orally rather than in writing that I am pregnant?

No. The regulations require that the declaration must be in writing.

12. If I have not declared my pregnancy in writing, but the licensee suspects that I am pregnant, do the lower dose limits apply?

No. The lower dose limits for pregnant women apply only if you have declared your pregnancy in writing. The United States Supreme Court has ruled (in *United Automobile Workers International Union v. Johnson Controls, Inc.*, 1991) that "Decisions about the welfare of future children must be left to the parents who conceive, bear, support, and raise them rather than to the employers who hire those parents" (Reference 7). The Supreme Court also ruled that your employer may not restrict you from a specific job "because of concerns about the next generation." Thus, the lower limits apply only if you choose to declare your pregnancy in writing.

13. If I am planning to become pregnant but am not yet pregnant and I inform the licensee of that in writing, do the lower dose limits apply?

No. The requirement for lower limits applies only if you declare in writing that you are already pregnant.

14. What if I have a miscarriage or find out that I am not pregnant?

If you have declared your pregnancy in writing, you should promptly inform the licensee in writing that you are no longer pregnant. However, if you have not formally declared your pregnancy in writing, you need not inform the licensee of your nonpregnant status.

15. How long is the lower dose limit in effect?

The dose to the embryo/fetus must be limited until you withdraw your declaration in writing or you inform the licensee in writing that you are no longer pregnant. If the declaration is not withdrawn, the written declaration may be considered expired one year after submission.

16. If I have declared my pregnancy in writing, can I revoke my declaration of pregnancy even if I am still pregnant?

Yes, you may. The choice is entirely yours. If you revoke your declaration of pregnancy, the lower dose limit for the embryo/fetus no longer applies.

17. What if I work under contract at a licensed facility?

The regulations state that you should formally declare your pregnancy to the licensee in writing. The licensee has the responsibility to limit the dose to the embryo/fetus.

18. Where can I get additional information?

The references to this Appendix contain helpful information, especially Reference 3, NRC's Regulatory Guide 8.29, "Instruction Concerning Risks from Occupational Radiation Exposure," for general information on radiation risks. The licensee should be able to give this document to you.

For information on legal aspects, see Reference 7, "The Rock and the Hard Place: Employer Liability to Fertile or Pregnant Employees and Their Unborn Children--What Can the Employer Do?" which is an article in the journal *Radiation Protection Management*.

You may telephone the NRC Headquarters at (301) 415-7000. Legal questions should be directed to the Office of the General Counsel, and technical questions should be directed to the Division of Industrial and Medical Nuclear Safety.

You may also telephone the NRC Regional Offices at the following numbers: Region I, (610) 337-5000; Region II, (404) 562-4400; Region III, (630) 829-9500; and Region IV, (817) 860-8100. Legal questions should be directed to the Regional Counsel, and technical questions should be directed to the Division of Nuclear Materials Safety.

REFERENCES FOR APPENDIX

1. National Council on Radiation Protection and Measurements, *Limitation of Exposure to Ionizing Radiation*, NCRP Report No. 116, Bethesda, MD, 1993.
2. International Commission on Radiological Protection, *1990 Recommendations of the International Commission on Radiological Protection*, ICRP Publication 60, Ann. ICRP 21: No. 1-3, Pergamon Press, Oxford, UK, 1991.
3. USNRC, "Instruction Concerning Risks from Occupational Radiation Exposure," Regulatory Guide 8.29, Revision 1, February 1996.⁽¹⁾ (Electronically available at <http://www.nrc.gov/reading-rm/doc-collections/reg-guides/>)
4. Committee on the Biological Effects of Ionizing Radiations, National Research Council, *Health Effects of Exposure to Low Levels of Ionizing Radiation* (BEIR V), National Academy Press, Washington, DC, 1990.
5. United Nations Scientific Committee on the Effects of Atomic Radiation, *Sources and Effects of Ionizing Radiation*, United Nations, New York, 1993.

6. R. Doll and R. Wakeford, "Risk of Childhood Cancer from Fetal Irradiation," *The British Journal of Radiology*, 70, 130-139, 1997.
7. David Wiedis, Donald E. Jose, and Timm O. Phoebe, "The Rock and the Hard Place: Employer Liability to Fertile or Pregnant Employees and Their Unborn Children--What Can the Employer Do?" *Radiation Protection Management*, 11, 41-49, January/February 1994.
8. National Council on Radiation Protection and Measurements, *Considerations Regarding the Unintended Radiation Exposure of the Embryo, Fetus, or Nursing Child*, NCRP Commentary No. 9, Bethesda, MD, 1994.
9. National Council on Radiation Protection and Measurements, *Risk Estimates for Radiation Protection*, NCRP Report No. 115, Bethesda, MD, 1993.
10. National Radiological Protection Board, *Advice on Exposure to Ionising Radiation During Pregnancy*, National Radiological Protection Board, Chilton, Didcot, UK, 1998.
11. M.L. Thomas and D. Hagemeyer, "Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities, 1996," Twenty-Ninth Annual Report, NUREG-0713, Vol. 18, USNRC, 1998.⁽²⁾

REGULATORY ANALYSIS

A separate regulatory analysis was not prepared for this regulatory guide. A regulatory analysis prepared for 10 CFR Part 20, "Standards for Protection Against Radiation" (56 FR 23360), provides the regulatory basis for this guide and examines the costs and benefits of the rule as implemented by the guide. A copy of the "Regulatory Analysis for the Revision of 10 CFR Part 20" (PNL-6712, November 1988) is available for inspection and copying for a fee at the NRC Public Document Room, 2120 L Street NW, Washington, DC, as an enclosure to Part 20 (56 FR 23360).

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