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FROM: Frank J. Congel, Director  
Division of Radiation Safety  
and Safeguards  
Office of Nuclear Reactor Regulation

SUBJECT: EIGHTH SET OF QUESTIONS AND ANSWERS ON 10 CFR PART 20

An eighth set of questions and answers of the major revision of 10 CFR Part 20 is enclosed for your information. A draft of these questions and answers was provided earlier for your review.

These questions and answers are being made publicly available.

Original signed by LeMoine J. Cunningham

Frank J. Congel, Director  
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PREFACE TO THE EIGHTH SET OF QUESTIONS AND ANSWERS  
ON THE MAJOR REVISION OF 10 CFR PART 20

Following is the eighth set of questions and answers concerning the major revision of 10 CFR Part 20 (10 CFR Part 20 Sections 20.1001 - 20.2402) and its implementation. The first seven sets of these questions and answers were compiled and published in NUREG/CR-6204, *Questions and Answers Based on Revised 10 CFR Part 20*, May 1994, which also contains additional information about the questions and answers.

These questions and answers have been compiled primarily for use in training NRC regional inspection staff members. The questions and answers are being made publicly available for information of interested individuals and organizations and to encourage communications between the public and the NRC staff concerning the major revision of the NRC's standards for protection against radiation. Additional questions and answers are being compiled and will be made publicly available at a later date.

The questions were provided by individuals and organization outside the NRC and by NRC staff members. Answers to these questions have been prepared and reviewed by NRC staff members in the NRC Offices of Nuclear Reactor Regulation, Nuclear Material Safety and Safeguards, Nuclear Regulatory Research, Office of State Programs, and the five NRC Regional Offices. The questions and answers also have been reviewed by an attorney in the NRC Office of the General Counsel.

The answers to questions do not constitute official legal interpretations, which can only be provided by the General Counsel, and they do not reflect official NRC policy as approved by the Commission. The answers do reflect NRC staff decisions and technical opinions on specific aspects of regulatory requirements.

## EIGHTH SET OF QUESTIONS AND ANSWERS ON 10 CFR PART 20

### 10 CFR 20.1001 Purpose

QUESTION 471: Do the NRC and State Regulations allow individuals to have "dual" employment, i.e., to work at, and receive occupational radiation dose, under two separate licensees during a year without "terminating" at one licensee before "starting" at the other licensee? For example, can an occupationally exposed, monitored nuclear power plant employee work and receive monitored occupational dose at the nuclear plant and also work as a radiographer under a State radiography license?

ANSWER: Yes, to both questions, assuming that appropriate controls are in place to ensure that regulatory requirements [including 10 CFR 20.1201(f) and, if applicable, 20.2104(e)] are met by both licensees.

10 CFR Part 20 requires each licensee to control the occupational dose received by an individual. 10 CFR 20.1001(b) states that it is the purpose of 10 CFR Part 20 "...to control the receipt, possession, use, transfer, and disposal of licensed material by any licensee in such a manner that the total dose to an individual (including doses resulting from licensed and unlicensed radioactive material and from radiation sources other than background radiation) does not exceed the standards for protection against radiation prescribed in...". Furthermore, by definition (in 10 CFR 20.1003), "Occupational dose means the dose received by an individual...from licensed and unlicensed sources of radiation, whether in the possession of the licensee or other person." Therefore, each licensee must consider the total dose received by an individual from all licensed sources and activities during a particular time period. 10 CFR Part 20 does not impose any restriction on the number of licenses, or of licensees, under which an individual can receive occupational doses of radiation during any particular time period.

Question and answer 41 (in the first set of questions and answers, under the section headed 10 CFR 20.1201) and health physics position summary HPPOS-047 in NUREG-5569 provide additional information that is relevant to this question. (Question and answer 41 discusses the need for each licensee under whose license an individual receives an occupational dose to know of any other occupational dose received by that individual under a different license. HPPOS-047 discusses individual monitoring for external dose for an individual who works under more than one license.)

(References: 10 CFR 20.1001, 20.1003, 20.1201, 20.2104)

### 10 CFR 20.1003 Definitions

QUESTION 469: The definition of "year" includes a statement that "the licensee may change the starting date of the year used to determine compliance by the licensee provided that the change is made at the beginning of the year and that no day is omitted or duplicated in consecutive years." Does this mean that a licensee can change the starting date of the year to a month other than January?

ANSWER: No. By definition, in Part 20, a "year" means a period of time beginning in January... (emphasis added). Thus the starting date of the year, before and after any changes, must be in January. See the following related questions under the section headed 10 CFR 20.1003: #1 and #40 (in the first set) and #434 (in the seventh set). (Reference: 10 CFR 20.1003)

QUESTION 482: By definition, in 10 CFR 20.1003, a "High radiation area means an area accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 0.1 rem (1 mSv) in 1 hour at 30 centimeters from the source or from any surface that the radiation penetrates".

In this definition of "high radiation area":

- (a) What is an "area" when this definition is applied within a building at a nuclear reactor facility, particularly a non-power reactor facility?
- (b) What does "accessible to individuals" mean?
- (c) Which "dose equivalent" quantity is meant: deep dose, eye dose, shallow dose?
- (d) What is the meaning of the words "at 30 centimeters from the source or from any surface that the radiation penetrates" when applied to a radiation beam from a research reactor?

ANSWER:

(a) An "area" has the ordinary meaning of a definitely bounded part or section of a building set aside for a specific purpose or use. In the case of a high radiation area, the specific purpose or use is the control of access. The boundaries of the high radiation area may be defined by existing physical (structural) barriers, such as the walls of a room or piping and equipment or the boundaries of the area may be defined by barriers (barricades) that are created for the purpose of defining the area.

(b) The NRC staff has taken the position in Regulatory Guide 8.38, "Control of Access to High and Very High Radiation Areas," that an accessible area is an area that can reasonably be occupied by a major portion of an individual's whole body. As defined in 10 CFR 20.1003, "whole body means, for purposes of external exposure, head, trunk (including male gonads), arms above the elbow, or legs above the knee." Therefore, an area into which an individual can only insert an extremity, or a portion of an extremity (e.g., a finger) is not "accessible to individuals." However, the upper arm, the head, the eye and the male gonads are considered to be major portions of the whole body. Although Regulatory Guide 8.38 applies only to nuclear power plants, the staff is taking the same position (on the meaning of "accessible to individuals") with respect to non-power reactors. [In some cases, this position may also be applicable to teletherapy facilities.]

The beam itself is not an "area" [see question and answer (a), above]; however, a small area containing the beam may be created around the beam within a larger area by providing barriers that define the boundaries of the smaller area. If the smaller area containing the beam is accessible to individuals (and the 100 mrem in an hour criterion is met), the smaller area is a high radiation area. If the beam itself is not accessible to individuals (i.e., the beam is cocooned), the area is not a high radiation area regardless of the dose rate within the beam. (See health physics position document HPPPOS-242 concerning cocooning.)

(c) The deep dose equivalent. (See Question and Answer #74 in the second set of questions and answers on the revised 10 CFR Part 20.)

(d) The source of the radiation in the beam is the atomic nuclei within the reactor that are undergoing fission or radioactive decay. Because this source of radiation is inside the reactor, the distance from it is not the relevant distance for purposes of the definition. The relevant (30-cm) distance is the distance measured from the "surface that the radiation penetrates," which is the surface where the beam exits the reactor or beam port. Thus, for the purpose of determining whether or not the area around the radiation beam is a high radiation area, the relevant dose equivalent is the dose equivalent in the beam. (The staff recognizes that there may be little change in dose rate with distance along the beam.)

Note: Additional information concerning radiation beams at non-power reactors is provided in the following questions and answers in this set: #483 under section 10 CFR 20.1201, #484 under section 10 CFR 20.1601, and #485 under section 10 CFR 20.1602.

(References: 10 CFR 20.1003, 20.1601, 20.1602,)

#### 10 CFR 20.1008 Implementation

QUESTION 470: 10 CFR 20.1008(d) provides that if a license condition or technical specification exempted a licensee from a provision in 10 CFR §§ 20.1-20.601, it exempts a licensee from the corresponding provision in 10 CFR §§ 20.1001-20.2401. NRC's Office of Nuclear Reactor Regulation (NRR) has issued exemptions from provisions in 10 CFR §§ 20.1-20.601 in the form of letters to the licensees and a Federal Register Notice rather than in the form of license conditions (which include technical specifications). Must a licensee who has an exemption from a provision in 10 CFR §§ 20.1-20.601 in a form other than a license condition or technical specification apply for a new exemption under the corresponding provision in 10 CFR §§ 20.1001-20.2401?

ANSWER: No. The intent of 10 CFR 20.1008(d) is that any exemption from a provision in 10 CFR §§ 20.1-20.601 exempts a licensee from the corresponding provision in 10 CFR §§ 20.1001-20.2401. In particular: (1) Any exemption pursuant to 10 CFR 20.302 is also an exemption pursuant to 10 CFR 20.2002. (2) Any exemption pursuant to 10 CFR 20.103(e) is also an exemption pursuant to 10 CFR 20.1703(a)(2). (3) Any exemption pursuant to 10 CFR 20.501 is also an exemption pursuant to 10 CFR 20.2301. (Reference: 10 CFR 20.1008)

NOTE TO REVIEWERS: 10 CFR 20.1008 was "removed" from 10 CFR Part 20, effective 01/01/94, in one of a number of "minor conforming amendments" to NRC regulations (58 FR 67657, 12/22/93). That error will be corrected.

10 CFR 20.1101 Radiation Protection Programs

QUESTION 476: What is the status of ALARA during emergencies?

ANSWER: As stated in 10 CFR 20.1001(b), nothing in 10 CFR Part 20 (including the ALARA provisions) should be construed as limiting actions that may be needed to protect health and safety. ALARA by definition means making every reasonable effort to maintain exposures to radiation as far below the dose limits as is practical taking into consideration, among other things, benefits to public health and safety, and other societal and socioeconomic considerations. These considerations also prevail in an emergency and, accordingly, prompt action required under emergencies is consistent with ALARA considerations. (See related questions concerning Part 20 requirements and emergency worker doses at nuclear power plants under the heading for 10 CFR Part 50.)

(References: 10 CFR 20.1101, 20.1003, 50.47)

10 CFR 20.1201 Occupational Dose Limits for Adults

QUESTION 475: What is the status of NRC (IE) Information Notice No. 84-40, "Emergency Worker Doses,"?

ANSWER: While the numerical values of the dose guidelines for emergency workers have been revised, the basic philosophy in NRC (IE) Information Notice No. 84-40, "Emergency Worker Doses," still applies and has been subsequently clarified in the new Part 20. After an emergency has been concluded, the doses incurred during the emergency must be accounted for under 10 CFR Part 20. (See related questions concerning Part 20 requirements and emergency worker doses at nuclear power plants under the heading for 10 CFR Part 50.)

(References: 10 CFR 20.1201, 20.1206, 50.47, Other)

QUESTION 483: The NRC staff has taken the position in Regulatory Guide 8.38, "Control of Access to High and Very High Radiation Areas," that an **accessible** area is an area that can reasonably be occupied by a **major portion** of an individual's whole body. How is the concept of a **major portion** of an individual's body used in the assignment of the dose equivalent for that individual?

ANSWER: It isn't. Although the term "major portion of the whole body" is used in clarifying the meaning of the term "accessible" in relation to areas (rooms), it has no relevance in relation to the assigned deep dose equivalent

or the shallow dose equivalent. As stated in 10 CFR 20.1201(c), "The assigned deep-dose equivalent must be for the part of the body receiving the highest exposure" regardless of whether this part is a major, or a minor, portion of the whole body. Also, by definition, "the shallow-dose equivalent [ $H_s$ ], which applies to the external exposure of the skin or an extremity, is taken as the dose equivalent at a tissue depth of 0.007 centimeter [ $7 \text{ mg/cm}^2$ ] averaged over an area of 1 square centimeter." Thus, for example, if the highest dose to an extremity is the dose to a finger from a radiation beam, the assigned shallow-dose equivalent to that extremity is the shallow-dose equivalent to the portion of the finger that was in the beam.

Note: Additional information concerning radiation beams at non-power reactors is provided in the following questions and answers in this set: #482 under section 10 CFR 20.1003, #484 under section 10 CFR 20.1601, and #485 under section 10 CFR 20.1602.

(References: 10 CFR 20.1201, 20.1003, 20.1601, 20.1602, Reg. Guide 8.38)

#### 10 CFR 20.1206 Planned Special Exposures

QUESTION 463: If an individual receives an external deep dose equivalent (DDE) during a planned special exposure (PSE), the amount of that DDE is subtracted from the DDE PSE limit. Is it also subtracted from the shallow dose equivalent (SDE), the whole body (WB) limit and the eye limit?

ANSWER: [Note: This response assumes that the "limit(s)" in the question refer to the provisions of 10 CFR 20.1206(e) and that the "WB limit" in the question is the total effective dose equivalent (TEDE).] The DDE (deep dose equivalent) is subtracted from the TEDE PSE "limit" but is not subtracted from the PSE "limit" for the SDE and eye dose incurred during the PSE. The SDE incurred during the PSE is subtracted from the PSE "limit" for the SDE, and the eye dose received during the PSE is subtracted from the eye dose "limit". In other words, each dose type (DDE, SDE, eye dose) is considered separately. However, if the value of the DDE is also the best available measurement/estimate of the SDE and the eye dose, that value can be used for the SDE and the eye dose and subtracted from the corresponding PSE "limits" for these doses.

(Reference: 10 CFR 20.1206)

QUESTION 466:

(a) A licensee authorizes a planned special exposure (PSE) of 4 rem total effective dose equivalent (TEDE) for a particular individual; however, after the PSE the licensee finds that the actual TEDE to the individual was 5.5 rem. Is it permissible for the licensee to assign 0.5 rem to "routine" dose in order to avoid an overexposure situation?

(b) A licensee authorizes a PSE of 3 rem TEDE for a particular individual in addition to a "routine" TEDE of 3 rem for a particular individual on a particular job. That individual has received less than 1 rem TEDE in the current year before the PSE. After the job is completed, the licensee finds that the individual has received a total dose (TEDE) of 9 rem. May the licensee assign 5 rem to PSE and 4 rem to "routine" dose?

ANSWER:

(a) No. A PSE that resulted in a 5.5 rem TEDE to an individual would be in violation of the limit in 10 CFR 20.1206(e)(1). It is not permissible retrospectively to reallocate doses between PSE [to which the limits of 10 CFR 20.1206(e) apply] and "routine" doses [to which the limits of 10 CFR 20.1201(a) apply], in order to avoid violations of the limits in 10 CFR 20.1206(e).

(b) No. In this example, the PSE dose is the dose to be received in excess of the 3 rem "routine" dose. Thus the actual PSE dose is 6 rems (9 rems minus 3 rems), which exceeds the 5-rem limit of 10 CFR 20.1206(e). As indicated in the answer to part (a) of the question, the licensee may not retrospectively reallocate doses between PSE and "routine" doses.

(Reference: 10 CFR 20.1206)

10 CFR 20.1208 Dose to an Embryo/Fetus

QUESTION 462: 10 CFR 20.1208 requires the licensee to evaluate dose to the embryo/fetus of a declared pregnant woman during 9 months of gestation. If there has been an intake which deposits licensed material in the embryo/fetus, is the licensee required to evaluate the committed effective dose equivalent to the infant after it is born and becomes a member of the public. Question and answer #42 addresses the situation of a breast feeding mother who transfers licensed material via an intake to her infant. The scenario above appears to be similar and would appear to have the same response (the licensee must evaluate the dose). Is this correct?

ANSWER: No. 10 CFR 20.1208 requires the licensee to limit (and, therefore, to evaluate) the dose to the embryo/fetus during the entire pregnancy (emphasis added). 10 CFR 20.1208 does not require the licensee to limit, or to evaluate, the dose to the infant after it is born (and after the woman's pregnancy has ended) when it is no longer an embryo/fetus and has become a member of the public. (This answer assumes that the requirements of 10 CFR 20.1208 have been satisfied with respect to the intake by a declared pregnant woman and the corresponding dose to the embryo/fetus.) 10 CFR 20.1208 applies to the control of the dose to an embryo/fetus dose during pregnancy. After birth, there is no embryo/fetus and, therefore, no dose to an embryo/fetus. The scenario in Question #42 differs significantly from the scenario outlined in the question above. The scenario in Question #42 concerned an intake by an infant (who is a *member of the public* and not an embryo/fetus) that occurred after the birth of the infant (i.e., after the end of the pregnancy of the mother).

(Reference: 10 CFR 20.1208)



QUESTION 490: A woman who receives some occupational radiation exposure and who is not a "declared pregnant woman" as defined in 10 CFR 20.1003, does one or more of the following:

- (1) submits medical insurance claims for prenatal care
- (2) requests maternity leave

Do either or both of these actions constitute a declaration of pregnancy so that the woman becomes a "declared pregnant woman", as defined in 10 CFR 20.1003?

ANSWER: No. The submission of a medical insurance claim for prenatal care and/or a request (including a written request) for maternity leave do not constitute a declaration of pregnancy that results in the woman being a "declared pregnant woman" as defined in 10 CFR Part 20. To be a "declared pregnant woman", a woman must (voluntarily) "...inform her employer, in writing, of her pregnancy and the estimated date of conception."

Discussion: In the context of 10 CFR Part 20, the answer to the question of whether a woman is, or is not, a declared pregnant woman does not depend (as the question seems to imply) on whether or not there exist indications, or even documented evidence, that the woman is pregnant. Whether or not the woman is pregnant is not the issue. The issue, rather, is whether or not a woman who is occupationally exposed to radiation, and who is pregnant, wants to have special dose limits (in 10 CFR 20.1208) imposed during her pregnancy. If she does, she states that desire by "officially" declaring herself pregnant, i.e., by doing so in writing in accordance with the definition of "declared pregnant woman" in 10 CFR 20.1003. Such a declaration signifies the woman's consent to have the special limits of 10 CFR 20.1208 applied to her while she is pregnant. These dose limitation provisions cannot be applied to her unilaterally by the licensee, without the woman's consent. That consent comes voluntarily in the form of the written declaration. A licensee's knowledge of, or ability to detect, the woman's pregnancy is not relevant in this context. [See also the brief discussion of the U. S. Supreme Court decision in the case of United Auto Workers (UAW) vs Johnson Controls in the answer to Question 59 (under section 10 CFR 20.1208 in the first set of questions and answers)].

(References: 10 CFR 20.1208, 20.1003)

#### 10 CFR 20.1301 Dose Limits for Members of the Public

QUESTION 464: 10 CFR 20.1301(a)(2) specifies that the dose in any unrestricted area must not exceed 2 mrem in any one hour. Is that limit considered to apply at some particular point with respect to the boundary of the restricted area (e.g., at the surface of the wall separating the unrestricted area from the controlled or the restricted area) or does this limit apply at some particular distance from the source as in the definitions of radiation and high radiation areas?

ANSWER: Neither. The limit in 10 CFR 20.1301(a)(2) is not "considered to apply at some particular point with respect to the boundary of a restricted area" and does not "apply at some particular distance from the source as in the definitions of radiation and high radiation areas." The limit of 2 mrem in any one hour in 10 CFR 20.1301(a)(2) applies anywhere within the unrestricted area.

"Radiation area" and "high radiation area" are defined in terms of the dose that an individual could receive in an hour at a specified distance from a source or surface. However, "restricted area" and "unrestricted area" are not defined in terms of dose or dose rate or distance from a source or surface; they are defined in terms of the presence or absence of access limitation or control.

Note: 10 CFR 20.1302 addresses compliance with the dose limits for individual members of the public and, although it does not specify a particular location with respect to the 2 mrem in an hour requirement, it does require the licensee to perform surveys to demonstrate compliance. The option of 10 CFR 20.1302(b)(2) for demonstrating compliance includes the provision in 10 CFR 20.1302(b)(2)(ii) for demonstrating that the dose to an individual does not exceed 2 mrem in an hour (and 50 mrem in a year) assuming that the individual is continuously present in the area. This demonstration of compliance may include realistic assumptions concerning the location of the individual within the area.

(References: 10 CFR 20.1301, 20.1302)

#### 10 CFR 20.1502 Conditions Requiring Individual Monitoring

QUESTION 465: In accordance with 10 CFR 20.1502, a licensee makes a prospective determination concerning an individual's likelihood of exceeding 10% of a limit. The licensee concludes that because of the type of work performed, the individual will receive no exposure at all for most of the year but will be exposed say during March, June and August only. Combining the estimated doses for these 3 months, it appears that the individual will exceed 10% of a limit.

(a) Does the licensee have to monitor for the entire year or can the licensee monitor during those months only? 10 CFR 20.1502 indicates "monitoring sufficient to demonstrate compliance" which would indicate monitoring only required during those months. NRC Forms 4 & 5 have codes to use for special circumstances e.g., NR for monitoring not required and ND for no dose detected. Neither of these actually fits this case since monitoring was required but no dosimeter was issued except during the months where exposure is received. Can the licensee conclude that monitoring is required during specific months only or does the prospective evaluation require monitoring for the entire year?

(b) If individual month monitoring during a year is OK should the licensee indicate NR (monitoring not required) during those months during which no dosimeter was provided?

ANSWER:

(a) Assuming (1) that the licensee can demonstrate that the individual will receive [and, in retrospect, did receive] "no exposure at all" [i.e., no occupational dose] except during March, June, and August, and (2) that the individual will not enter high or very high radiation areas, the licensee needs to provide individual monitoring only during March, June, and August.

(b) Yes.

(References: 10 CFR 20.1502, Regulatory Guide 8.7)

QUESTION 486: 10 CFR 20.1502 specifies the conditions requiring individual monitoring of external and internal occupational dose including the conditions in which individuals are "likely to receive" doses or intakes in excess of 10% of the applicable limits. The prospective evaluations that are needed to determine which individuals are "likely to receive" the doses or intakes in excess of the 10% threshold values are discussed in a number of previous questions and answers; however, the frequency of these prospective evaluations is not discussed. These questions and answers, and the fact that the occupational dose limits are annual limits, seem to imply that these prospective evaluations must be done every year. **Must these prospective evaluations be conducted at the beginning of each year or only when the likelihood of exceeding 10 percent of one or more of the applicable occupational dose limits changes as a result of changing conditions?**

ANSWER: These prospective evaluations (to determine which individuals are likely to exceed the 10% thresholds for individual monitoring) need to be repeated whenever there is a change in conditions that might change the likelihood of exceeding one or more of the 10% threshold values. (Reference: 10 CFR 20.1502)

10 CFR 20.1601 Control of Access to High Radiation Areas

QUESTION 484: 10 CFR 20.1601(c) permits licensees who desire to use methods for controlling access to high radiation areas other than the methods prescribed in 10 CFR 20.1601(a) or 20.1601(b) to apply to the Commission for approval of the alternative methods of control. What criteria will be used by the NRC staff in determining the acceptability of alternative methods that may be proposed by non-power reactor licensees for the control of high radiation areas containing radiation beams?

ANSWER: The following criteria will be used by the NRC(NRR) staff in determining the acceptability of alternative methods of control proposed by non-power reactor licensees pursuant to 10 CFR 20.1601(c):

1. Alternative methods of control must provide reasonable assurance that only knowledgeable individuals have access to the high

radiation area(s) containing radiation beams. A knowledgeable individual is someone who has received relevant training and who has knowledge of the radiological hazards associated with the beam and who has current knowledge of the operational status of the facility.

2. Clear administrative policies and procedures must be established to prevent unintended exposures to the radiation beam.
3. Reasonable precautionary warnings (such as postings, rope barricades, streamers, flashing lights, bells, or a combination of these) must be used to call the individual's attention to, or remind the individual of, the hazard.

Note: Additional information concerning radiation beams at non-power reactors is provided in the following questions and answers in this set: #482 under section 10 CFR 20.1003, #483 under section 10 CFR 20.1201, and #485 under section 10 CFR 20.1602.

(Reference: 10 CFR 20.1601)

QUESTION 488: If access to HRAs and VHRA's, during power operations, in a nuclear power reactor containment is controlled by locking the containment entrance, then would the posting in 20.1902 (b) & (c) still be required since the areas are not "accessible to individuals" and therefore do not meet the definitions of a HRA or VHRA that require posting by 10 CFR Part 20?

ANSWER: Yes, these areas are still required to be posted. The question confuses (1) means to control access to an accessible area with (2) means for making an area inaccessible. Controlling an area by locking its entryway per 10 CFR 20.1601(a)(3) does not make it inaccessible for the purposes of the definitions of HRAs and VHRA's in 10 CFR Part 20. Inaccessible areas (e.g., areas that have no entryways, or have entries with welded or bolted covers) are not required to be posted or have their access controlled. (References: 10 CFR 20.1601, 20.1602, 20.1003)

#### 10 CFR 20.1602 Control of Access to Very High Radiation Areas

QUESTION 485: Assuming that a research reactor licensee has adequate means to control access to a high radiation area containing a radiation beam, in accordance with 10 CFR 20.1601, what "additional measures" are acceptable for controlling access to a very high radiation area containing a radiation beam, in accordance with 10 CFR 20.1602?

ANSWER: Some examples of possible "additional measures" for controlling access to a very high radiation area include (1) enhanced training/instruction of individuals who have access to the very high radiation area, (2) special procedures for controlling access to the very high radiation area, and (3) the use of one or more controls specified in 10 CFR 20.1601(a) in addition to those being used at a facility to control access to a high radiation area.

Note: Additional information concerning radiation beams at non-power reactors is provided in the following questions and answers in this set: #482 under section 10 CFR 20.1003, #483 under section 10 CFR 20.1201, and #484 under section 10 CFR 20.1601.

(References: 10 CFR 20.1602, 20.1601)

QUESTION 487: In cases where Very High Radiation Areas (VHRA) are accessible via a ladder or stairway down to them, would removing the ladder/stairs make the areas inaccessible so that the areas do not meet the 10 CFR Part 20 definition of a VHRA and, therefore, become areas that are not required to be controlled as VHRAs?

ANSWER: Removing a ladder or stairs, in itself, may not make the area inaccessible, especially if an individual could climb or jump down into it. In some cases where the vertical drop is such that it would not be reasonable to assume anyone would try to access the area (e.g., a empty refueling cavity at a PWR), the absence of a ladder or staircase could make the area inaccessible and not subject to the access control requirements of 20.1601, or 20.1602. (See Regulatory Guide 8.38, section 1.5, second paragraph.)

(References: 10 CFR 20.1602, 20.1601, 20.1003, Reg. Guide 8.38)

QUESTION 489: Does a frame covered with plastic sheeting or nylon netting constitute an acceptable cocoon for an area that otherwise would be an HRA or VHRA?

ANSWER: No. Regulatory Guide 8.38 acknowledges the practice of making an area that would otherwise be a HRA or VHRA inaccessible with a cocoon (i.e., by completely enclosing it with a physical barrier that has no entryways). However, to make an area not accessible to individuals the barrier must be of a substantial material (e.g., chain link mesh, shielding plugs, etc.) that require specialized tools (e.g., wire cutters, hoist, etc.) to breach. Plastic sheeting or any other material that can be breached with a pocket knife would not provide a substantial barrier. (References: 10 CFR 20.1601, 20.1602, 20.1003)

#### 10 CFR 20.1702 Use of Other Controls

QUESTION 493: Does the wording of 10 CFR 20.1702 indicate that if airborne radionuclide concentrations in an area of the plant are below one DAC, then doses resulting from exposure to this airborne material are not required to be maintained ALARA?

ANSWER: No, 10 CFR 20.1101(b) contains the requirement that radiation doses be maintained ALARA. Allowing the airborne concentrations to be 0.5 DAC in a lunch room or lounge area (unless under some extreme circumstances) would not be acceptable. The requirements in 10 CFR 20.1702, in concert with 10 CFR

20.1701, state that if the airborne concentrations in an area cannot be maintained below one DAC (or 12 DAC-hr intake in a week), by process or engineering controls, then other controls shall be used to limit intakes of workers in this area. Since the use of these other controls can impact the individuals total effective dose equivalent (TEDE), the choice of controls and the decision to implement them, shall be based on maintaining TEDE ALARA. (References: 10 CFR 20.1702, 20.1701, 20.1101)

10 CFR 20.1703 Use of Individual Respiratory Protection Equipment

QUESTION 479: It is expected that once the new Part 20 is implemented, and the general use of respiratory protective equipment is reduced, there will be an increase in the number of facial contaminations at nuclear power plants.

(a) How will the NRC handle/deal with these increased facial contaminations at power reactor facilities?

(b) Do these facial contaminations have to be preplanned (e.g., an ALARA package/documentation) or can this be part of the day-to-day work evolutions in the plant?

ANSWER:

(a) With the proper implementation of the TEDE ALARA concept, the NRC expects that there may be an increase in facial contaminations in spite of the use of facial protective clothing. (Data from operating nuclear power plants that have successfully implemented a reduction in the issuance of respirators show that, in retrospect, the vast number of respirators were not needed to reduce intakes, but merely served as burdensome face shields.) The NRC is encouraged by reports of a decrease in the use of respirators (with a resulting decrease in TEDE), and by the corresponding increase in the use of facial protective clothing, to help minimize worker facial contaminations at nuclear power plants. In the past, the industry and the NRC may have placed too much emphasis on the prevention of skin contamination, which may have led to unnecessary and burdensome controls that were counterproductive to the TEDE ALARA concept. With respect to facial contamination, the relevant regulatory limits are those for the skin dose and the internal dose; minor skin contaminations are not likely to result in any doses that approach those limits. Therefore, the NRC plans to take no enforcement action when, despite reasonable efforts by the licensee to prevent it (e.g., appropriate use of facial protective clothing), minor facial contamination occurs during a planned work activity for which the TEDE ALARA evaluation dictated no respirator use.

(b) See the answer to question (a). It is not clear what the questioner means by facial contaminations that are "preplanned." We assume that the questioner recognizes that, after a TEDE ALARA evaluation, approved work controls, without the use of respirators, could lead to a high potential for facial contamination and that the questioner is concerned about the extent to which the planning and decisions that led to the contamination need to be

documented. The answer to question 60 (in the first set of questions and answers, under section 10 CFR 20.1703) indicates that each licensee may establish a threshold below which a record of a TEDE ALARA evaluation, concerning a potential use of respirators, is not needed. The NRC recognizes that minor facial contaminations may occur during jobs that fall below this documentation threshold. The applicable radiation work permit (RWP) may be the only job-specific documentation supporting the decision (evaluation) that led to the contamination; no special supplemental documentation is needed.

(Reference: 10 CFR 20.1703)

QUESTION 480: As part of implementation of the revised 10 CFR Part 20, respirator use may be reduced in order to minimize the time spent in radiation areas and thereby maintain the total effective dose equivalent (TEDE) ALARA. In addition to providing protection against airborne radioactive materials, full-face respirators also prevent facial contamination, particularly in the nose and mouth area. For some work performed without respirators in contaminated areas, the potential for facial contaminations may increase unless some other type of facial protective clothing is used, e.g., plastic face shields, surgical masks, or dust masks. In such cases, what requirements or guidelines should be used in determining that the facial protective clothing device is not a respirator (i.e., that respiratory protection program requirements do not apply)?

ANSWER: With respect to regulatory requirements, a device is a respirator, and the respiratory protection program requirements do apply, when the device has been tested and certified or had certification extended by the National Institute for Occupational Safety and Health/Mine Safety and Health Administration (NIOSH/MSHA) for use in respiratory protection. A dust mask may be certified by NIOSH/MSHA and, therefore, may be a respirator. Plastic face shields, comfort masks, and surgical masks are not respirators. As guidance, for protection against contamination, facial protective clothing/devices should not impose a physiological stress on the wearer; i.e., these devices should not significantly increase the energy requirement for the given task(s) because of their weight and should not add noticeable breathing resistance.

(Reference: 10 CFR 20.1703)

#### 10 CFR 20.1902 Posting Requirements

QUESTION 478: This question concerns posting of high radiation areas at nuclear power reactor facilities for which the reactor technical specifications, or other NRC/NRR document, authorize the use of alternative methods of control for access to high radiation areas. These methods of control include the use of locked doors or gates when the dose rates within the area exceed 1 rem/hour, but not when the dose rates do not exceed 1 rem/hour. 10 CFR 20.1902(b) requires posting of high radiation areas and specifies the words to be used on the sign or signs used for the required

posting. These words are "CAUTION, HIGH RADIATION AREA" or "DANGER, HIGH RADIATION AREA." However, 10 CFR 20.1901(c) states that "In addition to the contents of signs and labels prescribed in this part, the licensee may provide, on or near the required signs and labels, additional information, as appropriate, to make individuals aware of potential radiation exposures and to minimize the exposures." Does this statement permit the use of the words "CAUTION, LOCKED HIGH RADIATION AREA" or "CAUTION, RESTRICTED HIGH RADIATION AREA," or similar minor additions to the prescribed wording of 10 CFR 20.1902(b), on a sign that (1) is intended to comply with the provisions of 10 CFR 20.1902(b) on posting of high radiation areas and (2) is intended to provide the additional information that the high radiation area is locked in accordance with reactor technical specifications and licensee procedures?

ANSWER: Yes. (References: 10 CFR 20.1902, 20.1901)

#### 10 CFR 20.2003 Disposal by Release into Sanitary Sewerage

QUESTION 491: Regarding the application of the requirements for disposal of material to the sanitary sewers, is sludge considered readily dispersible material?

ANSWER: If the sludge can be shown to contain only readily soluble, non-biological material or dispersible biological material, it may be disposed of in the sewer, since in that case it would comply with the requirements for such disposal stated in 10 CFR § 20.2003. If material not permitted under § 20.2003 to be disposed of into the sewer, namely non-readily soluble material and non-dispersible biological material, can be separated out of the sludge, then the remaining sludge may be disposed of in the sewer. Otherwise, sludge may not be disposed of in the sewer. (Reference: 10 CFR 20.2003)

QUESTION 492: In using the method of "filtration and radiometric analysis of suspended solids" to examine the presence of "insoluble radioactive material" what is the radioactivity level (limit) which categorizes suspended solids into "insoluble radioactive/non-radioactive material"?

ANSWER: The matter referred to in the question pertains to information contained in NRC Information Notice (IN) 94-07, "Solubility Criteria for Liquid Effluent Releases to Sanitary Sewerage Under the Revised 10 CFR Part 20". This IN, which was addressed to materials licensees, does not specify criteria for deciding at what level the sample would be considered to differ sufficiently from background to indicate the presence of insoluble radioactive material. The criteria recommended in this case are those normally used in the industry, namely that the difference between the sample and background counts is significant at the 95 percent confidence level. It should be added that the system used to make these measurements should be capable of providing an adequate sensitivity for this kind of application. An adequate sensitivity is considered one that would provide the capability of detecting concentrations in the water equivalent to ten percent of those listed in Table 3 of Appendix B to 10 CFR §§ 20.1001-20.2402. (References: 10 CFR 20.2003, Appendix B; IN 94-87)



10 CFR 20.2104 Determination of Prior Occupational Dose

QUESTION 481: Some licensees will only be required to monitor and report the deep dose equivalent and may report "NR" (not required) for other dose categories, such as the shallow dose equivalent or lens dose equivalent, on the NRC Form 5. At subsequent licensee facilities where the individual is employed, how are such data required to be treated with regard to determining prior dose for the year in the "NR" categories? For example, an individual is required to be monitored by licensee "A" for deep dose equivalent only and receives 1 rem during the monitoring period. At termination of employment, the individual's dose is recorded on the NRC Form 4 as 1 rem deep dose equivalent and "NR" for the shallow dose equivalent and lens dose equivalent. Subsequently during the year, the individual is required to be monitored for shallow dose equivalent to the skin at licensee "B". With regard to demonstration compliance with limits, should licensee "B" determine the individual's remaining shallow dose equivalent to the skin to be 50 rem, or 49 rem (i.e., by assuming that 1 rem shallow dose equivalent to the skin was received concurrent with the 1 rem deep dose equivalent)?

ANSWER: In general, in the absence of measured values for the shallow dose equivalent and the eye (lens) dose equivalent, these values should be assumed to be equal to the deep dose equivalent when measured values for the deep dose equivalent are available. (This is a more reasonable assumption than assuming that these doses are zero.) For the example given, licensee "B" should determine the individual's remaining shallow dose equivalent to be 49 rem, rather than 50 rem.

(References: 10 CFR 20.2104, 20.2106)

10 CFR 20.2202 Notification of Incidents

QUESTION 477: What are the reportability requirements during an emergency?

ANSWER: Doses in excess of the limits in 10 CFR Part 20 are reportable in accordance with 10 CFR 20.2202. NRC understands that if notification activities may detract the licensee from taking prompt action during emergencies, then some delays in notification may occur. 10 CFR 20.1001(b) states, "...nothing in this part shall be construed as limiting actions that may be necessary to protect health and safety." (See related questions concerning emergencies at nuclear power plants under the heading for 10 CFR Part 50.)

(References: 10 CFR 20.2202, 20.1001, 50.47)

10 CFR Part 20 Appendix B

QUESTION 467: Do ALIs apply to intakes by injection or through wounds?

ANSWER: No. 10 CFR 20.1202(d), *Intake by wounds or absorption through skin*, requires that licensees shall evaluate and, to the extent practical, account for intakes through wounds or skin absorption. However, the ALIs in 10 CFR Part 20 Appendix B are calculated for intakes from inhalation or oral ingestion and are not appropriate for use with intakes by injection or through the skin. (However, as indicated in the Note following § 20.1202, the intake through intact skin has been included in the calculation of DAC for hydrogen-3 and does not need to be further evaluated.)

(References: 10 CFR Part 20 Appendix B, 10 CFR 20.1202, 20.1204)

QUESTION 468: Are doses from daughters included in calculating DACs for "submersion"?

ANSWER: No. For calculation of the DACs for submersion in air, the worker is assumed to be immersed in pure parent radionuclide, and no radiation from airborne progeny is considered; DACs for radionuclide progeny are calculated separately. See *Federal Guidance Report No. 11*, pages 18-19.  
(Reference: 10 CFR Part 20 Appendix B)

#### 10 CFR Part 50

QUESTION 472: 10 CFR Part 50, Section 50.47(b)(11), requires emergency plans to include emergency worker exposure guidelines consistent with the Environmental Protection Agency (EPA) Protective Action Guidelines (PAGs). In the PAGs, contained in EPA report number EPA 400-R-92-001 (Table 2-2), the EPA provides guidance on emergency worker dose limits that range from 5 rems to greater than 25 rems, depending on the emergency work activity and conditions involved. In the supporting text (pages 2-9 to 2-11), EPA notes that the "...dose to workers performing emergency services may be treated as a once-in-a-lifetime exposure, and not added to occupational exposure accumulated under non-emergency conditions for the purpose of ascertaining conformance to normal occupational limits..." This EPA guidance appears to be inconsistent with 10 CFR 20.1201, which states, "the licensee shall control the occupational dose to individual adults, except for planned special exposures..." to an annual limit of 5 rems total effective dose equivalent.

Because of the apparent differences between EPA guidance and NRC requirements regarding doses to emergency workers subject to occupational dose limits, the following two questions are posed:

(a) Can a Part 50 licensee allow emergency workers to receive doses in accordance with the EPA guidance that are in excess of the 10 CFR Part 20 occupational dose limits?

(b) How are the doses received by emergency workers accounted for relative to 10 CFR Part 20 occupational dose limits, and what impact do doses received during an emergency have on decisions regarding additional occupational dose during the remainder of the year? Consider an example in

which an emergency worker had already received 2 rems occupational dose during the year (i.e., prior to the emergency situation) and receives an additional 4 rems during performance of critical emergency response duties.

ANSWER:

(a) Yes. Facilities licensed under Part 50 have license conditions that require conformance with 10 CFR Part 20, as well as other parts of Title 10, Code of Federal Regulations. 10 CFR 20.1001 provides that "...nothing in this part shall be construed as limiting actions that may be necessary to protect health and safety..." 10 CFR 50.47(b)(11) [which applies only to nuclear power reactors] requires a licensee to provide a "Means for controlling radiological exposures, in an emergency, are established for emergency workers. The means for controlling radiological exposures shall include exposure guidelines consistent with EPA Emergency Worker and Lifesaving Activity Protective Action Guides."

(b) Dose received from exposure under emergency conditions is included as occupational dose to determine compliance with the occupational dose limits in 10 CFR Part 20. [Note that 10 CFR 20.1201(a) only excludes dose received as a result of planned special exposures.] In the example, all 6 rems, i.e., 2 rem for the year prior to the emergency and 4 rem due to critical emergency duties, is occupational dose against the limits in 10 CFR 20.1201. [In addition, 1 rem, i.e., the dose in excess of the 5 rem annual limit would be subtracted from the limits for planned special exposure for the individual, as provided in 10 CFR 20.1201(b)]. This individual would not be available for additional occupational exposure in the current year under 10 CFR 20.1201(a).

(References: 10 CFR 50.47, 20.1201, 20.1001)

QUESTION 473: Do we have to reach Part 20 dose limits before we can use emergency planning standard 50.47(b)11, which calls for exposure guidelines consistent with EPA emergency worker PAGs?

ANSWER: The question makes a distinction that is not made in the regulations. The dose limits in Part 20 apply to doses received from all licensed activities. However, the NRC recognizes that during emergencies Part 20 dose limits may need to be exceeded in order to take actions that may be necessary to protect the public health and safety. Therefore, during emergencies, licensees may authorize exposures in excess of Part 20 limits in accordance with 10 CFR 50.47(b)11. Note: 10 CFR 50.47 applies only to nuclear power reactors.

(References: 10 CFR 50.47, 20.1201)

QUESTION 474: Consider a worker whose occupational exposure for the current year has been 4 rem. Should this person's dose for an emergency activity be limited to doses given in Table 2-2 of EPA Manual minus 4 rem?

ANSWER: The dose limits in Part 20 are on a per-year (or per-lifetime) basis. The dose limitation scheme in Table 2-2 of EPA's Manual (PAGs) are on a per-event basis. All doses the worker receives during an emergency (a) are subtracted from the appropriate occupational dose limits for adults given in Part 20.1201 to determine the remaining dose(s) the worker may receive during the remainder of the year, or, (b) if these doses are from the planned special exposure (PSE), the doses are subtracted from the PSE limiting values given in 10 CFR 20.1206(e) to determine the PSE doses the worker may receive during the remainder of the year and during the remainder of the worker's lifetime. However, prior occupational dose need not be subtracted from the PSE to obtain a permissible exposure during an emergency. Therefore, in this example, the worker's allowable exposure for an emergency need not take into account the 4 rem already incurred in the current year. Presumably this is a once-in-a-lifetime situation; however, there is no requirement for licensees to insure that each individual employee is only involved in one emergency in their lifetime (i.e., restrict hiring of workers that have received prior emergency doses in excess of the Part 20 limits). (Note: This question, from a nuclear utility, and answer refer to an EPA Manual that applies only to nuclear power reactors.)

(References: 10 CFR 50.47, 20.1201, 20.1206)

Note: The following questions, from nuclear power plants, also concern the applicability of 10 CFR Part 20 requirements during an emergency: #475 (under section 10 CFR 20.1201, #476 (under section 10 CFR 20.1101), and #477 (under 10 CFR 20.2202).