



**Commonwealth Edison**

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November 10, 1982

Mr. Harold R. Denton, Director  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555

Subject: Dresden Station Units 1, 2 and 3  
Quad Cities Station Units 1 and 2  
Zion Station Units 1 and 2  
LaSalle County Station Units 1 and 2  
Byron Station Units 1 and 2  
Braidwood Station Units 1 and 2  
Control of Radioactively Contaminated  
Material - "De Minimis" Levels  
NRC Docket Nos. 50-10/237/249, 50-254/265,  
50-295/304, 50-373/374, 50-454/455 and  
50-456/457

- References (a): J. G. Keppler letter to Cordell Reed  
dated May 14, 1981
- (b): E. D. Swartz letter to R. C. DeYoung  
dated February 4, 1982
- (c): R. C. DeYoung letter E. D. Swartz  
dated May 18, 1982

Dear Mr. Denton:

Reference (a) transmitted IE Circular No. 81-07 "Control of Radioactively Contaminated Material" to the Commonwealth Edison Company for our information and use. The Circular discussion stated that "guidance is needed to establish operational detection levels below which the probability of any remaining, undetected contamination is negligible and can be disregarded...while at the same time providing a practical method for uncontrolled release of materials from the restricted area". However, the guidance actually given in the Circular was in terms of minimum sensitivities of monitoring instruments and not in terms of the needed release criteria.

As a result, Reference (b) questioned the intent of the IE Circular No. 81-07 and discussed its impact on the Commonwealth Edison Company "Radiation Protection Standards". Because of the ambiguous guidance given in the Circular, we requested that the NRC Staff provide us with a statement of concurrence with our

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interpretation of the Circular, or provide us with a definitive statement of release criteria for contaminated materials released to unrestricted areas. Reference (c) provided the NRC Staff response to our request.

Reference (c) advised the Commonwealth Edison Company that the NRC Staff cannot concur with the release criteria contained in our Radiation Protection Standards because "the regulations applicable to nuclear power reactor licensees do not provide for release of materials for unrestricted use that are known to be radioactively contaminated at any level". Additionally, we were advised that the method available for obtaining authorized release limits is to submit to the Office of Nuclear Reactor Regulation (NRR) a request for license amendment that addresses specific release limits.

Please be advised that our implementation of the release criteria for unconditional releases of materials from controlled areas as stated in the Commonwealth Edison Company Radiation Protection Standards is being held in abeyance based upon the Reference (c) NRC Staff position.

Our stations have been instructed that until the issue of "de minimis" levels is resolved, the release criteria to be used is that all materials shall be free of any contamination, removable or fixed, before an unconditional release is issued. Survey measurements shall be performed with instrumentation and techniques capable of detecting 5000 dpm/100 cm<sup>2</sup> total and 1000 dpm/100 cm<sup>2</sup> removable beta/gamma contamination, and 100 dpm/100 cm<sup>2</sup> fixed and 20 dpm/100 cm<sup>2</sup> removable alpha contamination. These values are the sensitivity limits for survey instruments/techniques given in IE Circular No. 81-07. Additionally, our stations have been instructed that those sensitivity limits should not be confused with release limits. If positive activity is found on a material below these values, the material cannot be released for unrestricted use.

The purpose of this letter is to pursue with the Office of NRR the establishment of a "de minimis" level for the Commonwealth Edison Company as recommended by the Office of Inspection and Enforcement in Reference (c). We believe that the basis exists to support our Radiation Protection Standards release criteria previously presented in Reference (b).

Two regulations which provide existing criteria for the control of contamination with respect to public and environmental safety are the Department of Transportation Title 49 CFR 173.397 "Contamination Control", and the "Rules and Regulations for Protection Against Radiation" promulgated by the Illinois Department of Public Health, amended September 29, 1976. The guidance provided

in these regulations is summarized in Attachment A to this letter along with the Commonwealth Edison Company Radiation Protection Standards values for comparison. As can be seen, the criteria given in our standards are below the limits given in Title 49 CFR 173.397 for ensuring the safety of the public during common carrier shipments of radioactive materials. Additionally, our release criteria would also satisfy the guidance for decontamination limits given in the Illinois Rules and Regulations, and the discussion and guidance sections of IE Circular No. 81-07.

While it appears that the regulations applicable to Nuclear Power Reactor Licensees do not include specific release criteria, the NRC Staff guidance has consistently promoted the use of Regulatory Guide 1.86 "Termination of Operating Licenses for Nuclear Reactors" with regard to release criteria. The limits given in Regulatory Guide 1.86 are also consistent with the numerical guidance given in IE Circular No. 81-07. For example, NUREG 0761 "Radiation Protection Plan for Nuclear Power Reactor Licensees", page 31, states:

"Procedures should describe local implementation of DOT requirements, criteria for release of materials from controlled areas (e.g., CSCAs), and include a program which verifies the absence of RAM from uncontrolled areas or outside of designated storage areas. Criteria should be that in Regulatory Guide 1.86."

Secondly, although written for medical institutions, Regulatory Guide 8.23 "Radiation Safety Surveys at Medical Institutions" was written to supply generic compliance guidance with Title 10 CFR 20.201 "Surveys". Regulatory Guide 8.23 Revision 1, page 8.23-4, states:

"Before the uncontrolled release of potentially contaminated medical instruments or equipment from restricted to unrestricted areas, surface contamination surveys should be conducted on such instruments and equipment for both removable and fixed contamination. If contamination is detected, decontamination procedures should be instituted and repeated until additional efforts do not significantly reduce contamination levels. The applicant or licensee may propose and justify total and removable contamination limits below which uncontrolled release of equipment is permitted. The limits given in Table 3 of this guide, as adapted from Table 1 of Regulatory Guide 1.86 "Termination of Operating Licenses for Nuclear Reactors", are acceptable to the NRC Staff and need not be justified by the licensee or applicant."

Therefore, the guidance outlined in Table 1 of Regulatory Guide 1.86 appears to provide a basis for the release criteria for unrestricted use currently accepted by the NRC Staff.

Attachment B to this letter provides a copy of the IAEA Safe Handling of Radionuclides Code of Practice, Appendix 2, Maximum Permissible Levels For Surface Contamination, 1973 Edition for your reference. This report provides a summary of the guidance given in a number of countries on the maximum permissible levels for surface contamination. The release limits in our standards compare quite favorably with this guidance criteria. Please note that although this is the latest revision of the IAEA Report, it is nine years old and may not be up-to-date with the current guidance used in some of these countries.

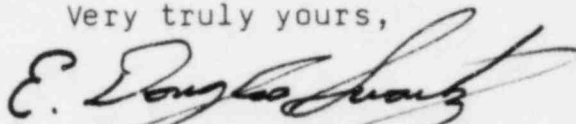
Title 10 CFR 20.105 addresses permissible levels of radiation in unrestricted areas and appears to allow the Commission the ability to approve proposed limits upon levels of radiation in unrestricted areas. We believe that a strong basis exists upon which to establish a "de minimis" level of radioactivity below which materials can be released from controlled areas for unrestricted use. It is the Commonwealth Edison Company judgement that this "de minimis" value should be the unconditional release limits given in our Company Radiation Protection Standards currently being held in abeyance.

Based upon the above, we hereby request Commission approval of our proposed "de minimis" levels. If necessary, and pending our receipt of your advisement, our request can be re-submitted in the form of a proposed amendment to each of our station licenses. However, we believe that it should not be necessary to obtain license amendments in order to secure your approval to implement our release criteria.

Your immediate attention to this matter is desired. Please address any questions that you or your staff may have concerning this issue of "de minimis" levels to this office.

One (1) signed original and forty (40) copies of this letter with Attachments are provided for your use.

Very truly yours,



E. Douglas Swartz  
Nuclear Licensing Administrator

Attachments

cc: R. C. DeYoung - D/OIE  
J. G. Keppler - RIII  
Region III Inspectors - D/QC/Z/LSCS/B/B

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ATTACHMENT A

TITLE 49 CFR 173.397 "CONTAMINATION CONTROL"

This provision establishes the following fixed and removable contamination levels below which the package and vehicle may be utilized for common carrier shipments:

<u>Type</u>	<u>Limit</u>
Removable beta, gamma emitters	22,000 dpm/100 cm <sup>2</sup> averaged over 300 cm <sup>2</sup> surface area
Removable alpha emitters	2,200 dpm/100 cm <sup>2</sup> averaged over 300 cm <sup>2</sup> surface area
(Note: Survey measurements are required to be less than 10% of the above values to ensure compliance).	
Fixed vehicle contamination	0.5 mrem/h at contact before returning vehicle to service

ILLINOIS RULES AND REGULATIONS, PART D, APPENDIX C  
Provides decontamination guides as follows:

<u>Type</u>	<u>Limit</u>
Removable beta, gamma emitter	220 dpm/100 cm <sup>2</sup> averaged over any one surface area 1,100 dpm/100 cm <sup>2</sup> maximum
Total (fixed) beta, gamma	0.25 mrem/h at 1 cm from surface
Removable alpha emitter	33 dpm/100 cm <sup>2</sup> averaged over any one surface 100 dpm/100 cm <sup>2</sup> maximum
Total (fixed) alpha	1,000 dpm/100 cm <sup>2</sup> averaged over any one surface 5,000 dpm/100 cm <sup>2</sup> maximum

COMMONWEALTH EDISON RADIATION PROTECTION STANDARDS

<u>Type</u>	<u>Limit</u>
Removable beta, gamma emitter	1,000 dpm/100 cm <sup>2</sup> maximum
Total (fixed) beta, gamma	5,000 dpm/100 cm <sup>2</sup> maximum
Removable alpha	20 dpm/100 cm <sup>2</sup> maximum
Total (fixed) alpha	100 dpm/100 cm <sup>2</sup> maximum

ATTACHMENT B

INTERNATIONAL ATOMIC ENERGY AGENCY

SAFE HANDLING OF RADIONUCLIDES  
1973 EDITION

Appendix 2

"Maximum Permissible Levels For Surface Contamination"

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SAFETY SERIES No. 1

SAFE HANDLING OF RADIONUCLIDES

1973 EDITION

CODE OF PRACTICE

SPONSORED BY THE  
INTERNATIONAL ATOMIC ENERGY AGENCY  
AND THE  
WORLD HEALTH ORGANIZATION

INTERNATIONAL ATOMIC ENERGY AGENCY  
VIENNA, 1973

MAXIMUM PERMISSIBLE LEVELS  
FOR SURFACE CONTAMINATION

## A2-1. INTRODUCTION

The decontamination procedures for contaminated surfaces should be continued until the residual contamination of the surface is reduced to an acceptable level. Unfortunately, there are no internationally agreed permissible levels for surface contamination, the latter depending on many variables. It is impossible to express a simple quantitative relationship between the levels of radioactivity on various surfaces and the resulting radiation doses to personnel. Actual radiation doses, particularly as a result of inhalation and ingestion, will depend on the nature of the radioactive material, working conditions, personal habits of the workers, fraction of 'free' and 'fixed' radioactive material, etc. The doses will thus depend on the circumstances associated with the contamination. These circumstances can vary greatly from one working area to another and therefore the permissible surface contamination levels may be influenced by:

- (a) The nature and quantity of the contaminating radionuclide;
- (b) The nature of the contaminated surface, e.g. its structure and condition;
- (c) Environmental factors, e.g. degree of occupancy, kind of work performed, ventilation, humidity;
- (d) Personnel contamination control measures provided in the working area, e.g. protective clothing, respiratory protection, and others;
- (e) Food habits of workers; in special circumstances, ingestion may be the critical pathway instead of inhalation.

Maximum permissible surface contamination levels are, however, of value in the monitoring of the working place and serve as an index of the degree of control for operations with radioactive material. Satisfactory results of surface contamination monitoring will usually indicate that the overall contamination control measures are sufficiently good to make routine air monitoring unnecessary. However, this conclusion must be used with care. There are conditions where it is not sufficient to rely on surface contamination monitoring, e.g. when operating with gases or vapours, or alpha emitters of very high toxicity such as plutonium, or where the measurement of surface contamination is difficult for technical reasons.

The results of measurements of surface contamination cannot be related quantitatively to the body content without gross simplification.

In addition, most monitoring instruments available are merely qualitative, since they cannot identify the radionuclide, measure the activity actually on the surface, or otherwise determine the extent of the hazard to persons.

Another factor to be considered is the common need to establish contamination control procedures for considerations other than personnel protection, e.g., counting rooms often require far more stringent contamination controls than would normally be necessary for personnel protection purposes.

The following data are given as examples of various maximum permissible levels for surface contamination used in different countries.

## A2-2. FRANCE

Radiotoxicity of radionuclides	Equipment and working places		Clothing	Skin
	in 'inactive' areas	in 'active' areas		
Very high	$\alpha$ -emitters: $10^{-5} \mu\text{Ci}/\text{cm}^2$	$\alpha$ -emitters: $10^{-4} \mu\text{Ci}/\text{cm}^2$	$\alpha$ -emitters: $10^{-5} \mu\text{Ci}/\text{cm}^2$	$\alpha$ -emitters: $5 \times 10^{-4} \mu\text{Ci}/\text{cm}^2$
	$\beta$ -emitters: $10^{-4} \mu\text{Ci}/\text{cm}^2$	$\beta$ -emitters: $10^{-3} \mu\text{Ci}/\text{cm}^2$	$\beta$ -emitters: $10^{-4} \mu\text{Ci}/\text{cm}^2$	$\beta$ -emitters: $5 \times 10^{-3} \mu\text{Ci}/\text{cm}^2$
High Medium Low	$10^{-4} \mu\text{Ci}/\text{cm}^2$	$10^{-3} \mu\text{Ci}/\text{cm}^2$	$10^{-4} \mu\text{Ci}/\text{cm}^2$	$5 \times 10^{-3} \mu\text{Ci}/\text{cm}^2$

Reference: Note No. 172, May 1956, issued by the French Atomic Energy Commission.

Note: The classification of radiotoxicities of radionuclides is similar to that given in this Manual.



A2-3. POLAND

Type of surface	Alpha contamination ( $\mu\text{Ci}/\text{cm}^2$ )	Beta contamination <sup>a</sup> ( $\mu\text{Ci}/\text{cm}^2$ )
Working surfaces in radioisotope laboratories of Type A	$10^{-4}$	$10^{-3}$
Working surfaces in radioisotope laboratories of types B and C	$10^{-5}$	$10^{-4}$
Surfaces of floors, walls, furniture and other things within radioisotope laboratories	$5 \times 10^{-4b}$	$5 \times 10^{-5b}$
Special clothes and towels, surfaces of gloves and special shoes used in radioisotope laboratories	$10^{-5}$	$10^{-4}$
Special underwear used in radioisotope laboratories	$10^{-4b}$	$10^{-5b}$

<sup>a</sup> For <sup>3</sup>H, contamination levels may be ten times higher.

<sup>b</sup> These values refer to fixed contamination; all 'free' contamination should be completely removed.

Note: The above permissible levels are on the average for surfaces which do not exceed 300 cm<sup>2</sup>.

A2-4. UNITED KINGDOM

Type of surface	Derived working limits ( $\mu\text{Ci}/\text{cm}^2$ )		
Surfaces of interiors and contents of total and partial enclosures (e. g. glove box and fume hood)	Minimum that is reasonably practicable		
Surfaces of active areas (excluding interior and contents of total and partial enclosures) and apparatus, equipment (including personal protective equipment), materials and articles within active areas	Alpha emitters		All other radionuclides
	Toxicity group 1	Toxicity groups 2-4	
	$10^{-4}$	$10^{-3}$	$10^{-3}$
Surfaces of the body	$10^{-5}$	$10^{-5}$	$10^{-4}$
All other surfaces, e. g. inactive areas, personal clothing, hospital bedding	$10^{-5}$	$10^{-4}$	$10^{-4}$

Reference: Code of Practice for the Protection of Persons Exposed to Ionizing Radiation in Research and Training, Her Majesty's Stationery Office (1968).

Note: The results of measurements may be averaged over areas as stated below:

Inanimate surfaces: 300 cm<sup>2</sup> (1000 cm<sup>2</sup> for floors, walls and ceilings)

Surfaces of the body: 100 cm<sup>2</sup> (hands: over the whole area of the hand, taken nominally as 300 cm<sup>2</sup>).

## A2-5. UNITED STATES OF AMERICA

The National Bureau of Standards Handbook 92, "Safe Handling of Radioactive Material", issued 9 March 1964, sets forth recommendations regarding unconditional release of surface-contaminated articles. Some of the relevant paragraphs are quoted below.

### "5.6. Control of contaminated articles

"Wherever radionuclides are used, clothing, tools, and equipment may become contaminated. These contaminated articles should be controlled to prevent spread of radioactive materials to clean areas or even to public areas outside of the installation. The problems involved depend on the magnitude of the program and the experience of the individual involved.

"In general, these items fall into two classes, namely: (1) those items which remain in a controlled area and are re-used, and (2) those items which are no longer needed and can be safely released, after decontamination, for use in other work.

#### "a. Controlled area

"Contamination levels in a controlled area are usually subjected to indirect checks such as measurement of air concentrations, frequent measurements of personnel contamination, etc., so that hazards induced by the presence of the contaminated article become a part of the overall program of control. For this reason, controls on the levels of contamination on articles used in the laboratory can be set by considerations of overall hazard and the protection program and specific limits are not needed.

"Equipment to be transferred from one controlled area to another should be thoroughly surveyed before moving and, if the level is higher than the general level in the new area, decontamination should be carried out. Equipment which is shown to be contaminated, or which has inaccessible parts and has been in a controlled area, should be marked with the radiation symbol. If it is to be stored or used by another group, it should also bear a description of the kind and level of contamination and the date of the survey. If the external radiation level exceeds one mrem per hour or if the contaminant is such that an individual might accidentally receive from it more than one-tenth of the maximum permissible body burden, then additional safeguards should be applied. These might include an outer container or shield or storage in a locked enclosure.

#### "b. Conditional release from control

"A conditional release procedure may provide suitable control of articles such as heavy mobile equipment which do not leave the installation, or of areas or fixed equipment not entirely free of contamination but causing insignificant hazard. Requirements for conditional release should include the following:

"a. The equipment is not contaminated to a level where it is a radiation hazard itself.

"b. The intended use presents no radiation hazard to informed users.

"c. Regulations for controlling the radiation or contamination are securely attached to the equipment in a prominent place.

"d. Property inventory records are maintained for each item listing its "home" location, radiation status, person responsible for control, and date of latest inventory.

#### "c. Unconditional release from control

"If articles are to be released from the controlled area for use in uncontaminated areas, surface contamination must not exceed acceptable levels. The permissible contamination depends on such factors as the relative hazard of the radionuclides involved, including both the external radiation and the uptake in the body; the degree of fixation of the contaminant; the mobility of the article involved; the accessibility of the contamination in the normal use of the article; and the possible interference with sensitive radiation measurements.

"Measurements of surface contamination are usually expressed in terms of the response of the instrument used rather than in absolute units because of the unknown depths of penetration of the material into the surface. Suggested levels of "significant contamination", below which an item can be released from the controlled area, are given in Table 6.

"TABLE 6. SUGGESTED LEVELS OF 'SIGNIFICANT CONTAMINATION'

Measuring instruments	Level for nuclides in groups	
	1 and 2 <sup>a</sup>	3 and 4 <sup>a</sup>
Geiger counter ( $\beta$ , $\gamma$ ) <sup>b</sup>	100 cpm	100 cpm
Ionization chamber	0.1 mrad/hr	1 mrad/hr
Alpha counter	1 d/m/cm <sup>2</sup>	10 d/m/cm <sup>2</sup>

<sup>a</sup> Table 2.

<sup>b</sup> Flat plate area of two square in.

"A "wipe" or "smear" test is valuable for detecting the presence of loose contamination. In this test, the object is wiped with a piece of cloth, paper, or sticky tape, and the material measured on a sensitive device which will detect the radiation emitted (see section 5.7). The degree of fixation of contamination and the mobility of the article are particularly important.

"Requirements for unconditional release should include the following:

"a. All accessible surfaces are free of significant contamination, as determined by surveys with sensitive alpha, beta, or gamma monitoring instruments, appropriate to the nuclides that have been used.

"b. It must be reasonable to presume that inaccessible surfaces are uncontaminated, on the basis of two premises: that, without being cleaned, accessible surfaces are free of significant contamination; and that no radioactive materials could have contaminated the inaccessible surfaces without having contaminated the outer surfaces as well.

"c. The materials of which the item is made are such as would not be likely to occlude radioactive materials.

"d. Wipe or smear tests indicate no detectable loose contamination and there is reasonable assurance that any fixed contamination will not become loose and subject to spread at some later date."

#### A2-7. SWITZERLAND

Maximum permissible levels for surface contamination  
( $\mu\text{Ci}/100\text{ cm}^2$ )

	Equipment and working places		Clothes	Skin
	Controlled area	Non-controlled area		
Alpha emitters	$10^{-2}$	$10^{-3}$	$10^{-3}$	$5 \times 10^{-4}$
Beta emitters	$10^{-1}$	$10^{-2}$	$10^{-2}$	$5 \times 10^{-3}$

#### A2-6. UNION OF SOVIET SOCIALIST REPUBLICS

Maximum permissible levels for surface contamination  
(particles/cm<sup>2</sup> · min)

Type of surface	Alpha emitters		Beta emitters
	Highly toxic <sup>a</sup>	Miscellaneous	
Integument	5	5	100
Surfaces of working areas:			
(1) Where staff is continuously present	10	40	2000
(2) Where staff is periodically present (second zone in the three-zone system of classification)	100	400	8000
Transfer and transport systems <sup>b</sup>	10	10	100

<sup>a</sup> Alpha emitters, the average permissible concentration of which in the air of working areas is less than  $2 \times 10^{-15}$  Ci/litre, are called highly toxic.

<sup>b</sup> In the case of gamma emitters, the dose rate at a distance of 0.1 m from the surface of transfer and transport systems should not exceed 0.1 mR/h.

(Approved by the Chief Public Health Inspector of the Soviet Union, 25 August 1969, No. 821-A-69.)