UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

March 6, 2019

EA-18-152

Eddie Harmon, Owner
NC Servo Technology Corp.
38422 Webb Drive
Westland, MI 48185

SUBJECT: NC SERVO TECHNOLOGY CORP. — RESULTS OF THE U.S. NUCLEAR REGULATORY COMMISSION'S INITIAL SITE VISIT AND REQUEST FOR CONFIRMATION OF VOLUNTARY CONTROLS: EXERCISE OF ENFORCEMENT DISCRETION

Dear Mr. Harmon:

I am writing to provide the results of the U.S. Nuclear Regulatory Commission (NRC) staff's initial site visit to the property at 38424 Webb Drive, Westland, Michigan, performed on August 17, 2018. The results are summarized below and are discussed in further detail in the enclosed report.

As described in the site summary attached to our letter dated June 20, 2018,[1] our records indicate that the NC Servo Technology Corporation may have previously repaired vintage aircraft self-luminous instruments (gauges) containing radium-226, a radioactive material regulated by the NRC.

During the initial site visit, the staff conducted radiation surveys over approximately 90 percent of the areas inside the NC Servo building. The staff did not survey the areas outside the building or under the driveway or building foundations.

As was discussed with you during our initial site visit, the staff found one small area of elevated activity that was above the average background reading within the NC Servo building. However, these surveys indicate that, even with conservative assumptions, a member of the public regularly working in this area would not receive an annual dose in excess of 25 millirem per year, the limit for unrestricted use, found in Title 10 of the *Code of Federal Regulations* (10 CFR) Section 20.1402, *Radiological criteria for unrestricted use*.

Also during our visit, the staff found elevated radiation levels on six aircraft gauge dials and an aircraft circuit breaker in the building. Up to 100 luminous products (e.g., dials) may be possessed under a general license in accordance with 10 CFR 31.12(a)(4), *General license for certain items and self-luminous products containing radium-226*. Based on the gauge dials present, NC Servo Technology is considered a general licensee. As a general licensee, NC Servo Technology must be in compliance with certain requirements under 10 CFR 31.12(c), which include that NC Servo Technology:

[1] Agencywide Documents Access and Management System (ADAMS) Accession No. ML18136A834.

(1) Must notify the NRC should there be any indication of possible damage to the product so that it appears it could result in a loss of the radioactive materials. A report containing a brief description of the event, and the remedial action taken, must be furnished to the Director of the Office of Nuclear Material Safety and Safeguards (NMSS), U.S. Nuclear Regulatory Commission, Washington, DC 20555–0001 within 30 days.

(2) Must not abandon products containing radium-226. The product, and any radioactive material from the product, may only be disposed of in accordance with 10 CFR 20.2008, *Disposal of certain byproduct material*, or by transfer to a person authorized by a specific license to receive the radium-226 in the product or as otherwise approved by the NRC.

(3) Must not export (i.e., transfer to a person or an international organization in a foreign country) products containing radium-226 except in accordance with 10 CFR Part 110, *Export and Import of Nuclear Equipment and Material*.

(4) Must dispose of products containing radium-226 only at a disposal facility authorized to dispose of radioactive material in accordance with any Federal or State solid or hazardous waste law, including the Solid Waste Disposal Act, as authorized under the Energy Policy Act of 2005, by transfer to a person authorized to receive radium-226 by a specific license issued under 10 CFR Part 30, *Rules of General Applicability to Domestic Licensing of Byproduct Material*, or equivalent regulations of an Agreement State, or as otherwise approved by the NRC.

(5) Must respond to written requests (including this request) from the NRC to provide information relating to the general license within 30 calendar days of the date of the request, or other time specified in the request. If you cannot provide the requested information within the allotted time, you must, within that same time period, request a longer period to supply the information. A written justification for the request must be provided to the Director of NMSS by means of an appropriate method listed in 10 CFR 30.6(a).

As discussed in the enclosure, the staff identified several self-luminous aircraft gauge dials containing radium-226, as well as elevated radiation levels on a surface within the building, indicating a loss of radioactive material as a result of damaged items. However, you had not reported this damage (i.e., broken glass on the gauges) to the NRC, as required in 10 CFR 31.12(c)(1). Based on this discovery, the staff determined that a violation of NRC requirements, as stated above in item (1), occurred.

The violation of 10 CFR 31.12(c)(1) for not reporting the damaged items was evaluated in accordance with the NRC Enforcement Policy and has been characterized at Severity Level III, a violation that could have resulted in moderate safety or security consequences. However, I have been authorized, after consultation with the Director, Office of Enforcement, to exercise enforcement discretion in this case in accordance with Section 3.5, “Violations Involving Special Circumstances,” of the Enforcement Policy. Consistent with applicable guidance in Enforcement Guidance Memorandum (EGM) 09-004, “Interim Guidance for Dispositioning Violations of Naturally Occurring and Accelerator-Produced Radioactive Materials (NARM) Requirements,”[2] the NRC will not cite the violation because: (1) the failure did not result in an actual safety, health, or security consequence; (2) the failure was not willful; (3) a reasonable argument was provided that the NC Servo Technology was not aware that the requirement was applicable; and

[2] ADAMS Accession No. ML091340060.

(4) a representative from NC Servo Technology committed to complying with the general license requirements in 10 CFR 31.12(c). The current Enforcement Policy is included on the NRC's Web site http://www.nrc.gov/about-nrc/regulatory/enforcement/enforce-pol.html.

If you would like to contest this action or its significance, a response must be provided within 30 days of the date of this letter, with the basis for denial and/or corrected information, to the NRC, ATTN.: Document Control Desk, Washington, D.C. 20555-0001, with a copy to the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001.

Please note that the exercise of enforcement discretion applies only to the damaged items as identified by the staff during the initial site visit on August 17, 2018. NC Servo Technology is required to follow 10 CFR 31.12(c)(1) and notify the NRC should there be any indication of possible additional damage to or changes to the state of the products now in its possession, should additional gauge dials be received or acquired in the future that have indication of possible damage, or if any other damaged products are identified. Should additional damage or other products be identified, a report containing a brief description of the event, and the remedial action taken, must be submitted to the Director, NMSS, within 30 days of the date of identification, as described on page 2 above.

Additionally, in accordance with 10 CFR 31.12(c)(5), the staff requests the following information be provided within **120 days** of the date of this letter:

1) Plans for either continued possession of the aircraft gauge dials and other item or disposition of the items.

2) Confirmation of the requested controls put in place for the material that is currently being stored in the building.

With respect to the limited area on the first floor of the NC Servo Technology building where we found levels of radiation above the average background, our survey of the site does not constitute final characterization of the site. However, as discussed above, these levels indicate that, even with conservative assumptions, a member of the public regularly working in this area would not receive an annual dose in excess of 25 millirem per year, the limit for unrestricted use found in 10 CFR 20.1402.

With respect to the dials that were found on the property, the staff determined that, based on the low levels of radium measured on the dials, there are no immediate health and safety concerns at this site. As discussed during our initial site visit, you verbally committed to keeping the gauge dials separated from the main working area and comply with the general license requirements of 10 CFR 31.12. Specifically, it was verbally committed that no work would be performed on the radium gauge dials, no additional radium gauge dials would be received, and the items that were identified would be left in their current state and kept away from the main working areas.

Please note that in accordance with 10 CFR 31.12, you are allowed to possess and maintain the intact gauge dials that were found during the initial site visit. However, should you wish to dispose of any of the gauge dials and other item, an NRC or Agreement State licensed service provider should be utilized to conduct any packaging of radioactive waste for transport and disposal in accordance with 10 CFR 31.12(c)(4). In addition, if you were to pursue any voluntary cleanup effort, we suggest that you consider consulting a licensed service provider to ensure that adequate measures are taken to limit the potential spread of radiological contamination. Please be aware that any remediation activities pursued at your site may also have to meet any State of

Michigan requirements and standards. As previously discussed, any voluntary site cleanup is the financial responsibility of the site owner.

In accordance with 10 CFR 2.390 of the NRC's "Agency Rules of Practice and Procedure," a copy of this letter will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of NRC's ADAMS. ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html.

We will be contacting you in the near future to discuss this letter and report. Please contact Mr. Stephen Koenick, Chief, Materials Decommissioning Branch, Division of Decommissioning, Uranium Recovery and Waste Programs, NMSS, at (301) 415-6631, or Mr. Richard Chang, Project Manager, at (301) 415-5888, should you have any questions in the interim.

Sincerely,

/RA/

Bo M. Pham, Acting Director
Division of Decommissioning, Uranium Recovery
and Waste Programs
Office of Nuclear Material Safety
and Safeguards

Docket No.: 03039081

Enclosures:
1. Site Status Report for NC Servo Technology
2. Copy of Applicable NRC Regulations

REGISTERED LETTER – RETURN RECEIPT REQUESTED

SUBJECT: NC SERVO TECHNOLOGY CORP. — RESULTS OF THE U.S. NUCLEAR REGULATORY COMMISSION'S INITIAL SITE VISIT AND REQUEST FOR CONFIRMATION OF VOLUNTARY CONTROLS **March 6, 2019**

DISTRIBUTION:
RidsRgn3MailCenter B. Lin, RIII M. Learn, RIII

ADAMS Accession No.: ML18260A328 ***via e-mail**

OFFICE	DUWP/PM	DUWP/LA	DUWP/LLWPB	DUWP/LLWPB	RIII/DNMS/BC
NAME	JWhited	CHolston	RNelson*	CGrossman*	MKunowski*
DATE	09/18/2018	09/19/2018	09/26/2018	09/28/2018	11/14/2018
OFFICE	DUWP/LLWPB/BC	NMSS EC	OE/EB	OGC (NLO)	DUWP (A)
NAME	SKoenick*	MBurgess*	JPeralta*	IIrvin*	BPham
DATE	12/07/2018	01/17/2019	01/28/2019	02/06/2019	03/06/2019

OFFICIAL RECORD COPY

Enclosure 1

OAK RIDGE ASSOCIATED UNIVERSITIES:

SITE STATUS REPORT FOR THE NC SERVO TECHNOLOGY CORPORATION AT 38424 WEBB DRIVE WESTLAND, MICHIGAN

March 6, 2019

EXECUTIVE SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) requested that Oak Ridge Associated Universities (ORAU) perform a radiation survey of the NC Servo Technology Corporation (NC Servo) property at 38424 Webb Drive in Westland, Michigan. NC Servo is a repair station certified by the Federal Aviation Administration that specializes in the selling/servicing of servo valves, motors, and drives (NC Servo 2017). The State of Michigan surveyed the facility in 1992 and identified "less than 10" radioactive gauges and localized contamination, presumably from radium. The facility personnel were instructed to perform general housecleaning to the areas, but there is no record of a follow-up to determine if the contamination had been properly cleaned (NRC 2017). The State's data are not available, and the potential for contamination on structural materials cannot be eliminated. The ORAU survey objectives were to determine if discrete sources of radium-226 and/or distributed radium-226 contamination are present, to identify the areas of highest contamination (if any radium contamination is identified), to determine if there are any current health and safety concerns, and to determine if further action by the NRC is needed.

ORAU performed the radiation surveys in accessible portions of NC Servo on August 17, 2018. On the ground level, surveyors identified one small area of elevated activity on the floor and a box containing six radium dials. On the second level, surveyors identified a box containing a circuit breaker confirmed to be a discrete source of radium. A dose assessment was performed, and results led to the conclusion that it is unlikely the identified sources would reasonably result in a dose in excess of regulatory requirements. Based on these results and the rationale that the initial site visit already generated a robust dataset to identify the extent of contamination, it is recommended that the NRC not perform a scoping survey. However, NRC should maintain contact with NC Servo personnel under a General License, as discussed in Title 10 *Code of Federal Regulations* Part 31.12, *General license for certain items and self-luminous products containing radium-226*, to ensure the identified discrete sources of radium are properly dispositioned.

SITE STATUS REPORT

Property:	NC Servo Technology Corporation 38424 Webb Drive Westland, MI 48185
Docket Number:	03039081
Current Property Name(s):	NC Servo Technology Corporation
Current Property Owner(s):	NC Servo Technology Corporation
Inspection Dates:	August 17, 2018
Inspector(s):	Bill Lin and Matthew Learn/U.S. Nuclear Regulatory Commission (NRC), supported by Stephen Pittman and Teresa Brown/Oak Ridge Associated Universities (ORAU)

1.0 INTRODUCTION

The Energy Policy Act of 2005 amended section 11e.(3) of the Atomic Energy Act of 1954 to place discrete sources of radium-226 (Ra-226) under NRC regulatory authority as byproduct material. In 1992, the State of Michigan conducted a survey of the NC Servo Technology Corporation (NC Servo) facility at 38424 Webb Drive in Westland, Michigan (MI). Surveyors identified "less than 10" radioactive gauges and localized contamination, presumably from radium. The facility personnel were instructed to perform general housecleaning of the areas, but there is no record of a follow-up to determine if the contamination had been properly cleaned (NRC 2017). The State's data are not available, and the potential for contamination on structural materials cannot be eliminated. The objectives of the initial site visit were to determine if discrete sources of Ra-226 and/or distributed Ra-226 contamination are present, to identify the areas of highest contamination (if any radium contamination is identified), to determine if there are any current health and safety concerns, and to determine if further action by NRC is needed. Surveys were performed as described within NRC's procedure, Temporary Instruction (TI) 2800/043, "Inspection of Facilities Potentially Contaminated with Discrete Radium-226 Sources" (NRC 2018).

Data collected during the survey are used either to eliminate the property from future NRC consideration or to plan future actions that may be needed to reduce Ra-226 exposure to current or future site occupants to levels that do not exceed the applicable regulatory requirement. It is important to note that destructive testing is not generally performed, as described within TI 2800/043.

2.0 PROPERTY DESCRIPTION AND INITIAL SITE VISIT CONSIDERATIONS

2.1 Property Description and History

NC Servo operates in a 1,100-m^2 (12,000-ft^2) two-story brick building located on a 5,200-m^2 (1.3-acre) plot. The physical address is 38424 Webb Drive, Westland, Michigan, and the

property is pictured in Figure 1. A review of available Google Earth™ images dating back to 1999 indicates that the site and building have not undergone significant configuration changes in the last 18 years (Google Earth Pro 2017). NC Servo is a Federal Aviation Administration (FAA) certified repair station that specializes in the selling/servicing of servo valves, motors, and drives. The company has been servicing equipment at this facility since 1975 (NC Servo 2017).

The State of Michigan surveyed the NC Servo facility in 1992. The site personnel at that time believed there were no radioactive items, but some ("less than 10") gauges were found, several of which belonged to customers—presumably the gauges contained Ra-226. The facility appeared to have "fairly localized contamination," including "a closet which has higher than normal background and several work surfaces with easily detectable areas of contamination." The facility personnel were instructed to perform general housecleaning of the areas, but there is no record of a follow-up to determine if the contamination had been properly cleaned. The State promised assistance for a follow-up survey of the work surfaces following the "attempt to wipe clean the work surfaces," but the record does not show that any follow-up action was taken (NRC 2017). The State's data are not available for review. The property owner, Mr. Eddie Harmon, was present during the 1992 State of Michigan survey and does not recall the location of the closet or workbenches reported to have been contaminated, or whether gauges or dials containing Ra-226 were ever present on the property (ORAU 2018).

Figure 1. Street View of NC Servo Technology Corporation (August 2016) (Google Earth Pro 2017)

2.2 Initial Site Visit Considerations

Prior to commencing survey activities, the general property layout was examined for consistency with historical information and to identify impediments to conducting the survey and/or health and safety considerations. No health or safety issues were noted.

3.0 SITE OBSERVATIONS AND FINDINGS

3.1 Summary of Activities

The inspection team conducted a survey at the 38424 Webb Drive property on the evening of August 17, 2018. The inspection team included Bill Lin and Matthew Learn (NRC) supported by Stephen Pittman and Teresa Brown (ORAU). Eddie Harmon (owner) acted as site escort and was present during the entire site visit. The inspection team's intention was to perform general area radiation surveys of accessible portions of the facility and delineate discrete sources of Ra-226, if identified.

Radiological surveys performed by the inspection team consisted of: gamma radiation scans within the building using a Ludlum model 44-10 2-inch by 2-inch (2×2) sodium iodide detector connected to a Ludlum model 2221 ratemeter/scaler; alpha-plus-beta radiation direct measurements using a Ludlum model 44-142 plastic scintillator connected to a Ludlum model 2221 ratemeter/scaler; and radiation exposure rate measurements using a Ludlum model 192 sodium iodide-based µR ratemeter[1]. A hand-held identiFINDER® model R300-Z was used to confirm, if possible, the presence of Ra-226 when elevated radiation levels were encountered. Table 1 presents the specific instruments used during the site visit. Smear samples were also collected at selected locations to quantify the removable surface activity levels.

Table 1. NC Servo Survey Instruments

Radiation Type (units)	Detector Type	Detector Model (Number)	Ratemeter (Number)
Alpha-plus-beta (cpm)	Plastic Scintillator	44-142 (1032) Calibrated 04/11/2018	2221 (1139) Calibrated 04/06/2018
Gross gamma (cpm)	Sodium Iodide Detector	44-10 (1152) Calibrated 05/15/2018	2221 (1139) Calibrated 04/06/2018
Gross gamma (µR/h)	Exposure Ratemeter	192 (1127) Calibrated 05/21/2018	N/A
Gamma Spectrum Analyzer (identiFINDER®)	CZT spectroscope	R300-Z (CG0343)[a]	N/A

CZT = cadmium zinc telluride
N/A = not applicable
Number = ORAU equipment barcode
cpm = counts per minute
µR/h = microRoentgen per hour
[a]A known radium source is used to confirm the identiFINDER® will identify Ra-226.

[1]Roentgen is a unit of exposure (energy absorbed in air), whereas a rem is a unit of dose delivered to a person (resulting from the radiation energy absorbed in that person). While Roentgen and rem are related, these are different units. Because they are similar for gamma ray energies from Ra-226, NRC makes the simplifying assumption in this case that these units are equivalent (1 Roentgen = 1 rem).

Summary of Daily Activities – August 17, 2018:

The inspection team arrived at 5:00 p.m. and met with the NC Servo owner. Surveys were initiated on the ground level, and the team soon identified a small (100 cm^2) area of elevated activity on the concrete floor of a small room of the north-central portion of the facility. The identiFINDER® confirmed Ra-226 contamination, so the team collected measurement data and a smear before resuming large-area surveys. The team then noted elevated radiation levels emanating from a box on a shelf in a room on the west-central portion of the facility. The box contained six radium dials, and per NRC's recommendation, the dials were secured in a plastic bag before measurement data were collected (no smear was collected). The team moved to the second level at approximately 7:00 p.m. and eventually noted elevated radiation levels emanating from a box in a room in the south-central portion of the facility. A Klixon® aircraft circuit breaker was identified, and the Ra-226 was confirmed via the identiFINDER®. The team surveyed all available floor space, though stored materials precluded full access, resulting in an estimated overall floor coverage of 90 percent for both levels. Surveys were concluded just after 9:00 p.m., NRC discussed the findings with the owner, and the inspection team departed the site at approximately 9:15 p.m.

3.2 Summary of Results

Appendix A presents survey/measurement maps and data tables that show results from the NC Servo site visit. Figures A-1 and A-2 present the general layout of the first and second levels, respectively, overlaid onto ORAU-generated facility drawings. The approximate location of gamma radiation measurements, elevated radiation measurement locations, and discrete sources of Ra-226 are shown. Note that drawings are not to scale and illustrated features are based on the observations of surveyors during the initial site visit.

Tables A-1 and A-2 present the radiation survey data associated with each figure and building level. As applicable, results include the measurement location, smear number and associated analytical laboratory alpha-plus-beta removable result in disintegrations per minute per 100 cm^2 (dpm/100 cm^2); gross and net total alpha-plus-beta responses in cpm and dpm/100 cm^2, respectively; gross 2×2 sodium iodide and exposure rates on contact in cpm and μR/h, respectively; and gross exposure rates in μR/h collected at 1 meter from the surface. Smears were submitted for gross alpha and gross beta analysis at a radio-analytical laboratory.

Static field measurements of total alpha-plus-beta activity in units of cpm were converted to total Ra-226 surface activity in units of dpm/100 cm^2 using the following equation:

$$dpm/100\ cm^2 = \frac{C - B}{\varepsilon_{tot} \times G}$$

Where:

C = measured count rate (cpm)
B = background count rate (cpm)
G = geometry factor (unitless) = $\frac{Physical\ Detector\ Area\ (cm^2)}{100\ cm^2}$ = 1.0

ε_{tot} = total weighted efficiency (unitless) = 1.2

Due to the number of emissions from Ra-226 and its associated progeny, multiple radiation particles are counted during the surface activity measurement. Therefore, a total weighted efficiency for Ra-226 and its associated progeny was calculated by:

$$\varepsilon_{tot} = \sum_{n} F_n \times \varepsilon_{i,n} \times \varepsilon_{s,n}$$

Where:

F_n = fractional abundance of n^{th} emission,

$\varepsilon_{i,n}$ = instrument efficiency for n^{th} emission, and

$\varepsilon_{s,n}$ = surface efficiency (0.25 for low-energy beta particles, 0.5 for high-energy beta particles) for n^{th} emission.

A total weighted efficiency of 1.2 is estimated, assuming radon and associated progeny are at 75 percent equilibrium with the parent radionuclide, Ra-226.

Table A-1 presents ground level results and shows that general area 2×2 sodium iodide detector responses ranged from 3,900 to 7,400-cpm gross gamma, and exposure rate results ranged from 2.5 to 7.0 µR/h—both ranges are consistent with variations in background. One small area of elevated activity (approximately 100 cm^2) was identified on the concrete floor, shown in Figure A-1 as location 36. Radiation levels of over 91,000-cpm gross gamma and 70 µR/h were measured on contact with the floor, though the exposure rate dropped to 6.0 µR/h at one meter above the ground. The alpha-plus-beta measurement of approximately 152,000-cpm gross was measured on contact with the floor, which converts to almost 130,000 dpm/100 cm^2 of Ra-226, as shown in Table A-2. Smear R0130 was collected from the location and submitted for laboratory analysis—the result of 80-dpm/100 cm^2 gross alpha/beta was reported by the analytical laboratory, as summarized in Table A-2.

Radiation measurements were also collected from the six dials, found in the west-central room (see location 5 in Figure A-1), after they were consolidated into a single plastic bag. The dials produced over 596,000-cpm gross gamma and 450 µR/h on contact, but the exposure rate dropped to only 8.0 µR/h at a distance of one meter. Gross alpha/beta measurements and smear samples were not collected on the plastic bag—the dials are obviously discrete sources of radium. The inspection team found no residual radioactivity in the box that originally housed the dials.

Table A-1 also presents second level results and shows that general area 2×2 sodium iodide detector responses ranged from 2,200- to 8,300-cpm gross gamma, and exposure rate results ranged from 2.0 to 9.0 µR/h—both ranges are consistent with variations in background. Radiation measurements were collected from the Klixon® aircraft circuit breaker, found in the south-central room (see location 66 in Figure A-2). The circuit breaker produced over 175,000-cpm gross gamma and 90 µR/h on contact, but the exposure rate dropped to 8.0 µR/h at a distance of one meter. The alpha-plus-beta measurement was approximately 12,600-gross cpm, which converts to over 10,000-dpm/100 cm^2 Ra-226, as shown in Table A-2. Smear R0131 was collected from the surface of the circuit breaker and submitted for laboratory analysis—the result of 2.1-dpm/100 cm^2 gross alpha/beta was reported, as summarized in Table A-2.

3.3 Summary of Dose Assessment Results

The NRC procedure, TI 2800/043, presents action-level exposure rates that the inspection team may use, while on site, to quickly determine whether gamma radiation levels could result in a dose above the 100-mrem/yr public dose limit in Title 10 of the *Code of Federal Regulations* Section 20.1301, *Dose limits for individual members of the* public (10 CFR 20.1301). Specifically, an exposure rate at 1 m of 40 µR/h above background conservatively corresponds to 100 mrem/yr assuming 2,300 hours of exposure in an industrial setting. These action levels do not consider site-specific conditions or internal exposure pathways (e.g., inhalation and ingestion). The maximum 1-m exposure rate associated with a discrete source of Ra-226 is 8.0-µR/h gross or approximately 3-µR/h net (after subtracting an average background of approximately 5 µR/h). Because the maximum measured 1-m exposure rate measurement does not exceed the industrial action level, it is concluded that current occupants will not receive a dose above the 100-mrem/yr limit considering external gamma radiation alone.

Although current occupants will not receive a dose above the public dose limit considering external gamma radiation alone and immediate controls are not necessary to protect public health based on the action levels, site-specific information, as described in *Dose Assessment Technical Basis Document for Potential Exposures to Discrete Sources of Radium-226 and Associated Contamination* (hereafter the Technical Basis Document) (ORISE 2017), may be used to determine if observed contamination would need to be cleaned up to meet NRC's criteria for unrestricted use. Although the NC Servo site is currently used for industrial purposes, it is plausible that a residential occupant should also be considered as the average member of the critical group, assuming the facility could be reconfigured for residential occupancy, to meet NRC's 25-mrem/yr dose limit for unrestricted use at 10 CFR 20.1402, *Radiological criteria for unrestricted use*. This hypothetical resident is assumed to spend up to 5,770 hours in close proximity to discrete sources of Ra-226. Because of the greater amount of time a residential occupant would be expected to spend in proximity to the contamination, the residential occupant is conservative as the average member of the critical group (i.e., would lead to greater estimated exposures). Potential exposure pathways include external gamma, inhalation, and secondary ingestion. Inhalation and secondary ingestion pathways are only complete when removable contamination is present, noting that the Technical Basis Document uses a default removable fraction of 10 percent. However, the only contaminated building media identified during the site visit is a 100-cm^2 section of concrete floor that produced a removable fraction much less than 1 percent, as presented in Table A-2. The Technical Basis Document describes how the dose estimate can be adjusted to account for the removable fraction and size of the contaminant. Table A-3 presents default concentration-based screening values that correspond to 25 mrem/yr when receptors are exposed to a small area of elevated activity, plus the adjusted screening values when the removable fraction represents only 1 percent of the total activity.

The small area of elevated activity on the concrete floor was measured at 130,000 dpm/100 cm^2 (see Table A-2), which is above the default residential screening value of 63,000 dpm/100 cm^2. The screening value increases to 270,000 dpm/100 cm^2 after adjusting the removable fraction to 1 percent. The associated residential dose is calculated as follows:

$$\text{Residential Dose (mrem/yr)} = 130{,}000\ dpm/100\ cm^2 \times \frac{25\ \text{mrem/yr}}{270{,}000\ dpm/100\ cm^2} = 12\ \text{mrem/yr}$$

Note that these calculations assume that the receptor will spend thousands of hours per year in close proximity to an approximately 100-cm^2 small area of elevated activity. Given that actual

receptors would more likely spend only a fraction of the respective occupancy periods near this section of floor, and the measured removable fraction is much less than 1 percent, these doses are considered to be conservative upper estimates.

Finally, doses for the dials and circuit breaker are not presented in this assessment. This is because those discrete sources of Ra-226 will be managed under a general license and do not represent uncontrolled residual activity that could expose future building occupants. In summary, though the dose assessment method described herein uses multiple conservative assumptions, maximum estimated results are still well below the 25-mrem/yr unrestricted use limit in 10 CFR 20.1402, *Radiological criteria for unrestricted use*. As a result of this layered conservatism, dose estimates should overestimate the true value.

4.0 OBSERVATIONS AND RECOMMENDATIONS

Based on the data collected during the August 2018 survey, the NC Servo property located at 38424 Webb Drive, in Westland, Michigan, does contain discrete sources of Ra-226. However, the individual items that contain radium will be managed under a general license, and the one area of elevated activity on the concrete floor is not at concentrations or configured in a manner that would reasonably result in a dose in excess of regulatory requirements. This conclusion is based on the following observations:

- Elevated direct gamma and surface radiation were measured at one 100-cm^2 area on the concrete floor of the ground level—Ra-226 was confirmed using the identiFINDER®.

- Six radium dials were discovered on the ground level, and one circuit breaker was discovered on the second level—Ra-226 was confirmed on the circuit breaker using the identiFINDER®.

- Dose estimates show that a current and hypothetical future building occupant would receive an estimated dose less than the 25-mrem/yr unrestricted use limit in 10 CFR 20.1402, even conservatively assuming long-term occupancy in close proximity to the small area of elevated activity on the concrete floor.

Based on these observations, it is recommended that the NRC not perform a scoping survey at the NC Servo site. The rationale behind this recommendation is that the initial site visit generated a robust dataset that already meets the scoping survey purpose, the dials and circuit breaker will be managed under a general license, and Ra-226 concentrations at the one identified small area of elevated activity are not sufficient to produce a dose above regulatory limits. However, because discrete sources of radium were found (i.e., the dials and circuit breaker), it is recommended that NRC maintain contact with NC Servo personnel, as discussed in 10 CFR 31.12, to ensure identified discrete sources of radium are properly dispositioned.

5.0 REFERENCES

Google Earth Pro 2017. Accessed August 29, 2018.

NC Servo 2017. http://www.ncservo.com/index.html, accessed August 29, 2018.

NRC 2017. *Letters from the State of Michigan re: Non-Military Radium Program*, prepared by the State of Michigan under Cooperative Agreement with the Nuclear Regulatory Commission, Regional Offices and the Office of Nuclear Materials Safety and Safeguards. July 7. (Agencywide Documents Access and Management System [ADAMS] Accession No. ML16288A777)

NRC 2018. *Inspection of Facilities Potentially Contaminated with Discrete Radium-226 Sources*, Temporary Instruction 2800/043, Revision 2, U.S. Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards, Washington, D.C., May. (ADAMS Accession No. ML17297B921).

ORISE 2017. *Dose Assessment Technical Basis Document for Potential Exposures to Discrete Sources of Radium-226 and Associated Contamination*, DCN 5289-TR-01-2, Oak Ridge Institute for Science and Education, Oak Ridge, Tennessee, May 30. (ADAMS Accession No. ML17152A204).

ORAU 2018. Field notes from the August 17, 2018 site visit and survey of the NC Servo Technology Corporation facility in Westland, Michigan.

APPENDIX A
SURVEY DATA TABLES AND MAPS FROM THE NC SERVO INITIAL SITE VISIT

Table A-1. NC Servo Site Visit General Area Survey Measurements						
Location No.	**2×2 NaI (cpm)**	**Exposure Rate (µR/h at 1 m)**		**Location No.**	**2×2 NaI (cpm)**	**Exposure Rate (µR/h at 1 m)**
Ground Level Measurements				**Second Level Measurements**		
1	5,800	5.0		48	6,600	6.0
2	5,300	5.0		49	4,400	5.0
3	4,600	3.0		50	5,400	5.0
4	4,600	5.0		51	4,100	3.0
5	596,000	8.0		52	3,700	3.0
6	4,000	2.5		53	3,500	4.0
7	5,400	4.0		54	4,000	5.0
8	4,900	4.0		55	3,800	4.0
9	5,300	4.0		56	3,300	3.0
10	5,600	4.5		57	3,400	3.0
11	5,200	4.0		58	2,200	2.0
12	5,100	4.5		59	3,700	2.0
13	5,500	4.5		60	3,600	4.0
14	4,600	3.0		61	4,300	4.0
15	7,000	5.5		62	4,500	5.0
16	5,700	3.5		63	4,500	5.0
17	5,800	5.0		64	5,600	5.0
18	5,500	4.0		65	5,200	6.0
19	5,200	4.0		66	175,000	8.0
20	5,200	4.0		67	8,300	9.0
21	5,900	4.5		68	6,700	7.0
22	5,400	4.0		69	6,100	7.0
23	5,700	6.0		70	7,100	5.0
24	6,400	5.0		71	5,500	5.0
25	6,100	5.0		72	7,100	7.0
26	3,900	4.0		73	5,600	5.0
27	5,000	4.0		74	6,000	6.0
28	4,300	4.0		75	4,500	4.0
29	5,000	4.0		76	4,400	4.0
30	5,500	5.0		77	4,100	4.0
31	7,200	7.0		78	5,500	6.0
32	4,100	4.0		79	7,100	4.0
33	5,900	5.0		80	5,000	6.0
34	6,800	6.0		81	5,400	5.0
35	5,300	5.0		82	6,300	6.0
36	91,000	6.0		83	5,700	4.0
37	4,600	4.0				
38	7,400	5.0				
39	6,500	5.0				
40	5,700	5.0				
41	6,500	5.0				
42	5,300	4.0				
43	5,500	5.0				
44	5,800	5.0				
45	4,700	3.0				
46	5,400	5.0				
47	6,400	7.0				

Location 5 represents six radium dials; Location 36 represents a small area of elevated activity on the concrete floor, and Location 66 represents a circuit breaker—see Table A-2 and Figures A-1 and A-2 for additional details.

Table A-2. NC Servo Elevated Activity Measurements								
Location No.	Removable[a]		Alpha-plus-Beta[b]		Gamma[c]			Comments
	Smear No.	(dpm/100 cm^2)	Gross	Total	Contact		1 m	
		Alpha-plus-Beta	cpm	dpm/100 cm^2	cpm	µR/hr	µR/hr	
Ground Level								
5	—	—	—	—	596,000	450	8.0	Six dials in plastic bag
36	5307R0130	80	152,000	130,000	91,000	70	6.0	Concrete floor; 100 cm^2
Second Level								
66	5307R0131	2.1	12,600	10,000	175,000	90	8.0	Klixon® aircraft circuit breaker

a) Smear counted for gross alpha/gross beta at an off-site analytical laboratory

b) Ludlum 44-142 plastic scintillator with Ludlum 2221 ratemeter

c) Ludlum 44-10 NaI with Ludlum 2221 ratemeter; Ludlum 192 NaI

— indicates measurement not collected at this location

Table A-3. NC Servo Default and Adjusted Screening Values								
Receptor	**Surface Area**	**Removable Fraction**	**Parameter**	**Units**	**External**	**Inhalation**	**Secondary Ingestion**	**Totals**
Residential	0.1 m^2	10%	DSR (yearly)	mrem/yr/dpm/100cm^2	5.74E-05	9.30E-05	2.48E-04	3.98E-04
			Screening Value	dpm/100 cm^2				63,000
		1.0%	DSR (yearly)	mrem/yr/dpm/100cm^2	5.74E-05	9.30E-06	2.48E-05	9.15E-05
			Screening Value	dpm/100 cm^2				270,000

DSR = dose-to-source ratio

Screening values associated with 25 mrem/yr; rounded to two digits

For residential receptor: 5,770 total time (hrs/yr) in close proximity to the small area of elevated activity

Site: NC Servo	**Area:** Ground Level	**Date(s):**08/17/2018	**Time:** 1900-2115
Surveyor(s): STP / TLB		**Purpose:** Site Visit	

Radiation Type	**Instrument**	**Detector**	**Background**
Gross Gamma	2221 / 1139	44-10 / 1152	3.9 - 7.4 kcpm[a]
Exposure Rate	192 / 1127	NA	2.5 - 7.0 µR/h[a]
Alpha+Beta	2221 / 1139	44-142 / 1032	450 cpm[a]

[a]Background varied depending on naturally occurring radioactive material in the area.

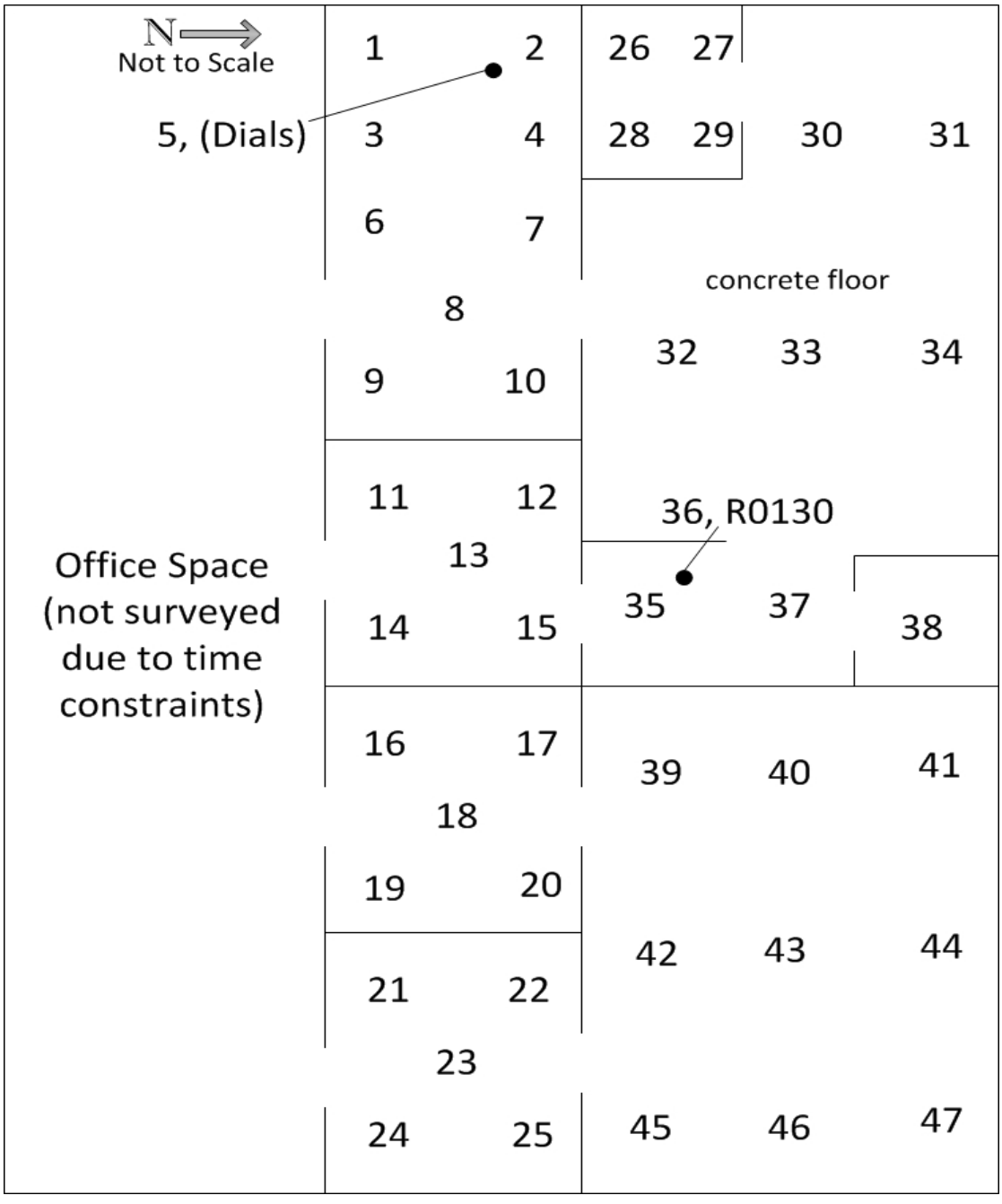

Figure A-1. NC Servo Radiation Measurement Information – Ground Level

Site: NC Servo	**Area:** Second Level	**Date(s):**08/17/2018	**Time:** 1900-2115
Surveyor(s): STP / TLB		**Purpose:** Site Visit	

Radiation Type	**Instrument**	**Detector**	**Background**
Gross Gamma	2221 / 1139	44-10 / 1152	2.2 - 8.3 kcpm[a]
Exposure Rate	192 / 1127	NA	2.0 - 9.0 µR/h[a]
Alpha+Beta	2221 / 1139	44-142 / 1032	450 cpm[a]

[a]Background varied depending on naturally occurring radioactive material in the area.

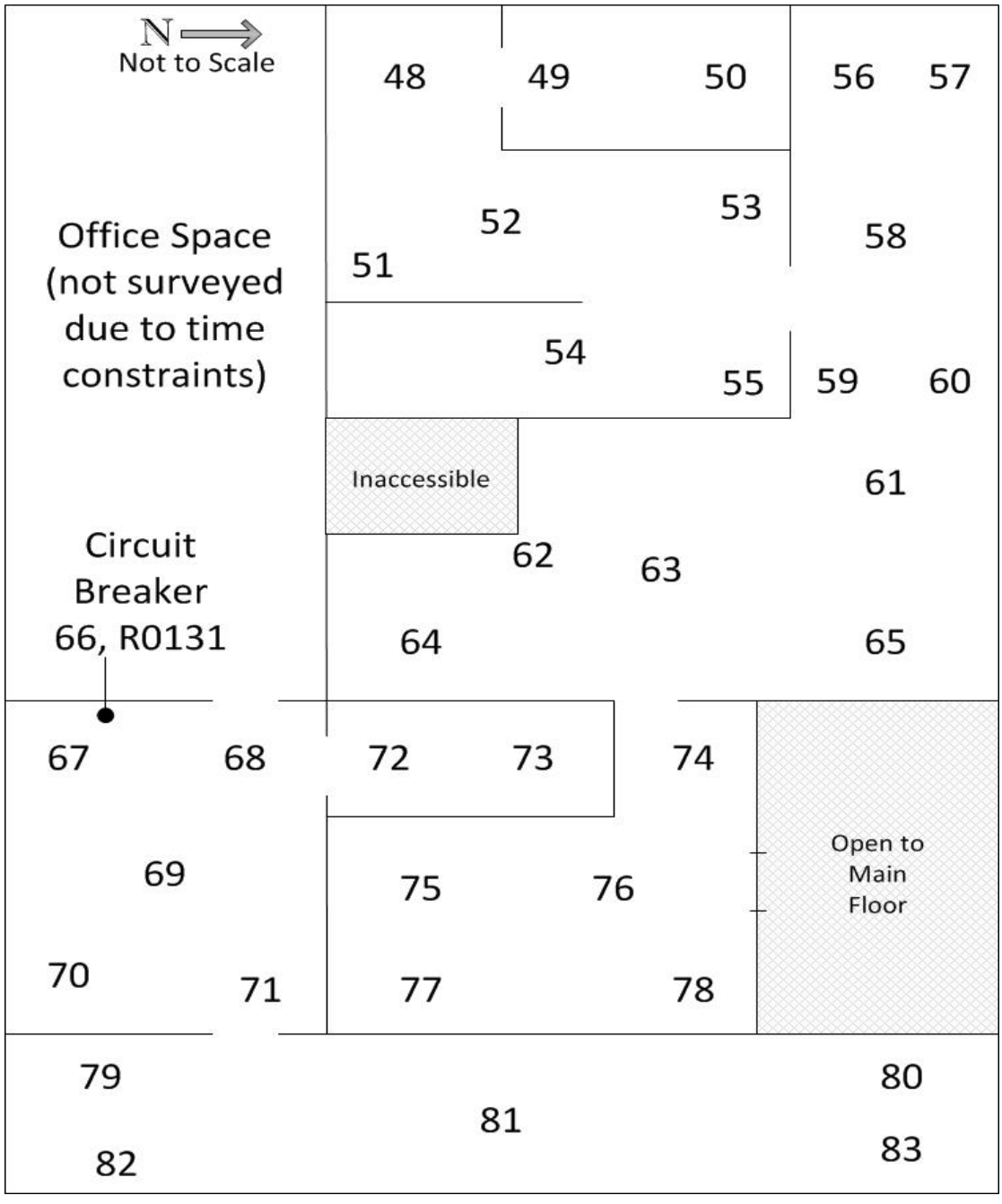

Figure A-2. NC Servo Radiation Measurement Information – Second Level

Enclosure 2

U.S. NUCLEAR REGULATORY COMMISSION

APPLICABLE REGULATIONS FROM

TITLE 10 OF THE *CODE OF FEDERAL REGULATIONS*

§ 20.2008 Disposal of certain byproduct material.

(a) Licensed material as defined in paragraphs (3) and (4) of the definition of *Byproduct material* set forth in §20.1003 may be disposed of in accordance with part 61 of this chapter, even though it is not defined as low-level radioactive waste. Therefore, any licensed byproduct material being disposed of at a facility, or transferred for ultimate disposal at a facility licensed under part 61 of this chapter, must meet the requirements of § 20.2006.

(b) A licensee may dispose of byproduct material, as defined in paragraphs (3) and (4) of the definition of *Byproduct material* set forth in § 20.1003, at a disposal facility authorized to dispose of such material in accordance with any Federal or State solid or hazardous waste law, including the Solid Waste Disposal Act, as authorized under the Energy Policy Act of 2005.

[72 FR 55922, Oct. 1, 2007]

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§ 31.12 General license for certain items and self-luminous products containing radium-226

(a) A general license is hereby issued to any person to acquire, receive, possess, use, or transfer, in accordance with the provisions of paragraphs (b), (c), and (d) of this section, radium-226 contained in the following products manufactured prior to November 30, 2007.

(1) Antiquities originally intended for use by the general public. For the purposes of this paragraph, antiquities mean products originally intended for use by the general public and distributed in the late 19th and early 20th centuries, such as radium emanator jars, revigators, radium water jars, radon generators, refrigerator cards, radium bath salts, and healing pads.

(2) Intact timepieces containing greater than 0.037 megabecquerel (1 microcurie), nonintact timepieces, and timepiece hands and dials no longer installed in timepieces.

(3) Luminous items installed in air, marine, or land vehicles.

(4) All other luminous products, provided that no more than 100 items are used or stored at the same location at any one time.

(5) Small radium sources containing no more than 0.037 megabecquerel (1 microcurie) of radium-226. For the purposes of this paragraph, "small radium sources" means discrete survey instrument check sources, sources contained in radiation measuring instruments, sources used in educational demonstrations (such as cloud chambers and spinthariscopes), electron tubes, lightning rods, ionization sources, static eliminators, or as designated by the NRC.

(b) Persons who acquire, receive, possess, use, or transfer byproduct material under the general license issued in paragraph (a) of this section are exempt from the provisions of 10 CFR parts 19, 20, and 21, and § 30.50 and 30.51 of this chapter, to the extent that the receipt, possession, use, or transfer of byproduct material is within the terms of the general license; provided, however, that this exemption shall not be deemed to apply to any such person specifically licensed under this chapter.

(c) Any person who acquires, receives, possesses, uses, or transfers byproduct material in accordance with the general license in paragraph (a) of this section:

(1) Shall notify the NRC should there be any indication of possible damage to the product so that it appears it could result in a loss of the radioactive material. A report containing a brief description of the event, and the remedial action taken, must be furnished to the Director of the Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555–0001 within 30 days.

(2) Shall not abandon products containing radium-226. The product, and any radioactive material from the product, may only be disposed of according to § 20.2008 of this chapter or by transfer to a person authorized by a specific license to receive the radium-226 in the product or as otherwise approved by the NRC.

(3) Shall not export products containing radium-226 except in accordance with part 110 of this chapter.

(4) Shall dispose of products containing radium-226 at a disposal facility authorized to dispose of radioactive material in accordance with any Federal or State solid or hazardous waste law, including the Solid Waste Disposal Act, as authorized under the Energy Policy Act of 2005, by transfer to a person authorized to receive radium-226 by a specific license issued under part 30 of this chapter, or equivalent regulations of an Agreement State, or as otherwise approved by the NRC.

(5) Shall respond to written requests from the NRC to provide information relating to the general license within 30 calendar days of the date of the request, or other time specified in the request. If the general licensee cannot provide the requested information within the allotted time, it shall, within that same time period, request a longer period to supply the information by providing the Director of the Office of Nuclear Material Safety and Safeguards, by an appropriate method listed in § 30.6(a) of this chapter, a written justification for the request.

(d) The general license in paragraph (a) of this section does not authorize the manufacture, assembly, disassembly, repair, or import of products containing radium-226, except that timepieces may be disassembled and repaired.

[53 FR 19246, May 27, 1988; 72 FR 55927 Oct. 1, 2007; 79 FR 75739, Dec. 19, 2014]

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U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

§ 30.6 Communications.

(a) Unless otherwise specified or covered under the regional licensing program as provided in paragraph (b) of this section, any communication or report concerning the regulations in parts 30 through 37 and 39 of this chapter and any application filed under these regulations may be submitted to the Commission as follows:

(1) By mail addressed: ATTN: Document Control Desk, Director, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555–0001.

(2) By hand delivery to the NRC's offices at 11555 Rockville Pike, Rockville, Maryland.

(3) Where practicable, by electronic submission, for example, via Electronic Information Exchange, or CD–ROM. Electronic submissions must be made in a manner that enables the NRC to receive, read, authenticate, distribute, and archive the submission, and process and retrieve it a single page at a time. Detailed guidance on making electronic submissions can be obtained by visiting the NRC 's Web site at *http://www.nrc.gov/site-help/e-submittals.html;* by e-mail to *MSHD.Resource@nrc.gov;* or by writing the Office of the Chief Information Officer, U.S. Nuclear Regulatory Commission, Washington, DC 20555–0001. The guidance discusses, among other topics, the formats the NRC can accept, the use of electronic signatures, and the treatment of nonpublic information.

(b) The Commission has delegated to the four Regional Administrators licensing authority for selected parts of its decentralized licensing program for nuclear materials as described in paragraph (b)(1) of this section. Any communication, report, or application covered under this licensing program must be submitted to the appropriate Regional Administrator. The Administrators' jurisdictions and mailing addresses are listed in paragraph (b)(2) of this section.

(1) The delegated licensing program includes authority to issue, renew, amend, cancel, modify, suspend, or revoke licenses for nuclear materials issued pursuant to 10 CFR parts 30 through 36, 39, 40, and 70 to all persons for academic, medical, and industrial uses, with the following exceptions:

(i) Activities in the fuel cycle and special nuclear material in quantities sufficient to constitute a critical mass in any room or area. This exception does not apply to license modifications relating to termination of special nuclear material licenses that authorize possession of larger quantities when the case is referred for action from NRC's Headquarters to the Regional Administrators.

(ii) Health and safety design review of sealed sources and devices and approval, for licensing purposes, of sealed sources and devices.

(iii) Processing of source material for extracting of metallic compounds (including Zirconium, Hafnium, Tantalum, Titanium, Niobium, etc.).

(iv) Distribution of products containing radioactive material under §§ 32.11 through 32.30 and 40.52 of this chapter to persons exempt from licensing requirements.

(v) New uses or techniques for use of byproducts, source, or special nuclear material.

(2) *Submissions*. (i) *Region I*. The regional licensing program involves all Federal facilities in the region and non-Federal licensees in the following Region I non-Agreement States and the District of Columbia: Connecticut, Delaware, and Vermont. All mailed or hand-delivered inquiries, communications, and applications for a new license or an amendment, renewal, or termination request of an existing license specified in paragraph (b)(1) of this section must use the following address: U.S. Nuclear Regulatory Commission, Region I, Nuclear Material Section B, Region I, 2100 Renaissance Boulevard, Suite 100, King of Prussia, PA 19406–2713; where email is appropriate it should be addressed to *RidsRgn1MailCenter.Resource@nrc.gov*.

(ii) *Region II.* The regional licensing program involves all Federal facilities in the region and non-Federal licensees in the following Region II non-Agreement States and territories: West Virginia, Puerto Rico, and the Virgin Islands. All mailed or hand-delivered inquiries, communications, and applications for a new license or an amendment, renewal, or termination request of an existing license specified in paragraph (b)(1) of this section must use the following address: U.S. Nuclear Regulatory Commission, Region I, Nuclear Material Section B, Region I, 2100 Renaissance Boulevard, Suite 100, King of Prussia, PA 19406–2713; where email is appropriate it should be addressed to *RidsRgn1MailCenter.Resource@nrc.gov*.

(iii) *Region III.* (A) The regional licensing program for mining and milling involves all Federal facilities in the region, and non-Federal licensees in the Region III non-Agreement States of Indiana, Michigan, Missouri and the Region III Agreement States of Minnesota, Wisconsin, and Iowa. All mailed or hand-delivered inquiries, communications, and applications for a new license or an amendment, renewal, or termination request of an existing license specified in paragraph (b)(1) of this section must use the following address: U.S. Nuclear Regulatory Commission, Region III, Material Licensing Section, 2443 Warrenville Road, Suite 210, Lisle, IL 60532 –4352; where e-mail is appropriate it should be addressed to *RidsRgn3MailCenter.Resource@nrc.gov*.

(B) Otherwise, the regional licensing program involves all Federal facilities in the region and non-Federal licensees in the Region III non-Agreement States of Indiana, Michigan, and Missouri. All mailed or hand-delivered inquiries, communications, and applications for a new license or an amendment, renewal, or termination request of an existing license specified in paragraph (b)(1) of this section must use the following address: U.S. Nuclear Regulatory Commission, Region III, Material Licensing Section, 2443 Warrenville Road, Suite 210, Lisle, IL 60532–4352; where e-mail is appropriate it should be addressed to *RidsRgn3MailCenter.Resource@nrc.gov*.

(iv) *Region IV.* (A) The regional licensing program for mining and milling involves all Federal facilities in the region, and non-Federal licensees in the Region IV non-Agreement States and territory of Alaska, Hawaii, Idaho, Montana, South Dakota, Wyoming and Guam and Region IV Agreement States of Oregon, California, Nevada, New Mexico, Louisiana, Mississippi, Arkansas, Oklahoma, Kansas, Nebraska, and North Dakota. All mailed or hand-delivered inquiries, communications, and applications for a new license or an amendment, renewal, or termination request of an existing license specified in paragraph (b)(1) of this section must use the following address: U.S. Nuclear Regulatory Commission, Region IV, Division of Nuclear Materials Safety, 1600 E. Lamar Blvd., Arlington, TX 76011–4511; where email is appropriate, it should be addressed to *RidsRgn4MailCenter.Resource@nrc.gov*.

(B) Otherwise, the regional licensing program involves all Federal facilities in the region and non-Federal licensees in the following Region IV non-Agreement States and territory: Alaska, Hawaii, Idaho, Montana, South Dakota, Wyoming, and Guam. All mailed or hand-delivered inquiries, communications, and applications for a new license or an amendment, renewal, or termination request of an existing license specified in paragraph (b)(1) of this section must use the following address: U.S. Nuclear Regulatory Commission, Region IV, Division of Nuclear Materials Safety, 1600 E. Lamar Blvd., Arlington, TX 76011–4511; where email is appropriate, it should be addressed to *RidsRgn4MailCenter.Resource@nrc.gov*.

[48 FR 16031, Apr. 14, 1983, as amended at 49 FR 19630, May 9, 1984; 49 FR 47824, Dec. 7, 1984; 50 FR 14693, Apr. 11, 1985; 51 FR 36000, Oct. 8, 1986; 52 FR 8241, Mar. 17, 1987; 52 FR 38392, Oct. 16, 1987; 52 FR 48093, Dec. 18, 1987; 53 FR 3862, Feb. 10, 1988; 53 FR 43420, Oct. 27, 1988; 58 FR 7736, Feb. 9, 1993; 58 FR 64111, Dec. 6, 1993; 59 FR 17465, Apr. 13, 1994; 60 FR 24551, May 9, 1995; 62 FR 22880, Apr. 28, 1997; 68 FR 58803, Oct. 10, 2003; 70 FR 69421, Nov. 16, 2005; 71 FR 15007, Mar. 27, 2006; 72 FR 33386, Jun. 18, 2007; 73 FR 5717, Jan. 31, 2008; 74 FR 62681, Dec. 1, 2009; 75 FR 21980, Apr. 27, 2010; 75 FR 73942, Nov. 30, 2010; 76 FR 72085, Nov. 22, 2011; 77 FR 39905, Jul. 6, 2012; 77 FR 43689, Jul. 25, 2012; 78 FR 17006, Mar. 19, 2013; 78 FR 32338, May 29, 2013; 79 FR 75739, Dec. 19, 2014; 80 FR 74979, Dec. 1, 2015]

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