

NUCLEAR INDUSTRY STANDARD PROCESS
Radiological Protection

Level 3 – Information Use

Radiation and Contamination Surveys

NISP-RP-002

Revision: 1

Industry Approval Date: December 4, 2018

This is an industry document for standardizing radiation protection processes. Standard processes and requirements are established to eliminate site-specific radiation protection procedures. The Institute for Nuclear Power Operations (INPO) maintains current procedures on the INPO website. Approval authority is granted by the industry contingent on a structured review and approval process by representatives of utility radiation protection organizations.

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1.0 Purpose

- 1.1 This procedure describes the process for performing and documenting radiological surveys.

2.0 Scope

- 2.1 This procedure provides instructions to survey for radiation and contamination levels. Instructions for air sampling are provided in NISP-RP-003, *Radiological Air Sampling*. Air sampling results are documented on survey maps as described in this procedure.
- 2.2 The forms referenced by this procedure are examples used to describe the pertinent information that should be recorded for future reference. Plant procedures may specify the use of equivalent forms or the use of electronic media for the same purposes.
- 2.3 Member utilities are expected to use this standard to enable supplemental workers to transition between nuclear power plants. Adherence to these instructions is expected without additional site requirements or process deviations being imposed that may require additional training or challenge the performance of supplemental workers.
- 2.4 Member utilities will implement these process requirements in site procedures and update site procedures whenever requirements or process steps in this Nuclear Industry Standard Process (NISP) are revised. Current revisions are maintained on the INPO website.

3.0 Definitions

- 3.1 Terms, acronyms, and definitions are provided in NISP-RP-013, *Radiation Protection Standard Glossary of Terms*.

4.0 Responsibilities

- 4.1 Radiation Protection is responsible for the implementation of the requirements of this procedure per Efficiency Bulletin 17-01 and the Nuclear Industry Standard Process Initiative.
- 4.2 Radiation Protection (RP) and Self Protection Workers (SPW) Qualified Personnel shall perform radiological surveys in accordance with this procedure and notify RPS as soon as practical of perceived discrepancies in radiological survey information.
- 4.3 The RP Qualified Person or RPS shall contact the Shift Manager immediately if an event causes an increase in dose rates by greater than a factor of 1,000 for their consideration to declare an Unusual Event.

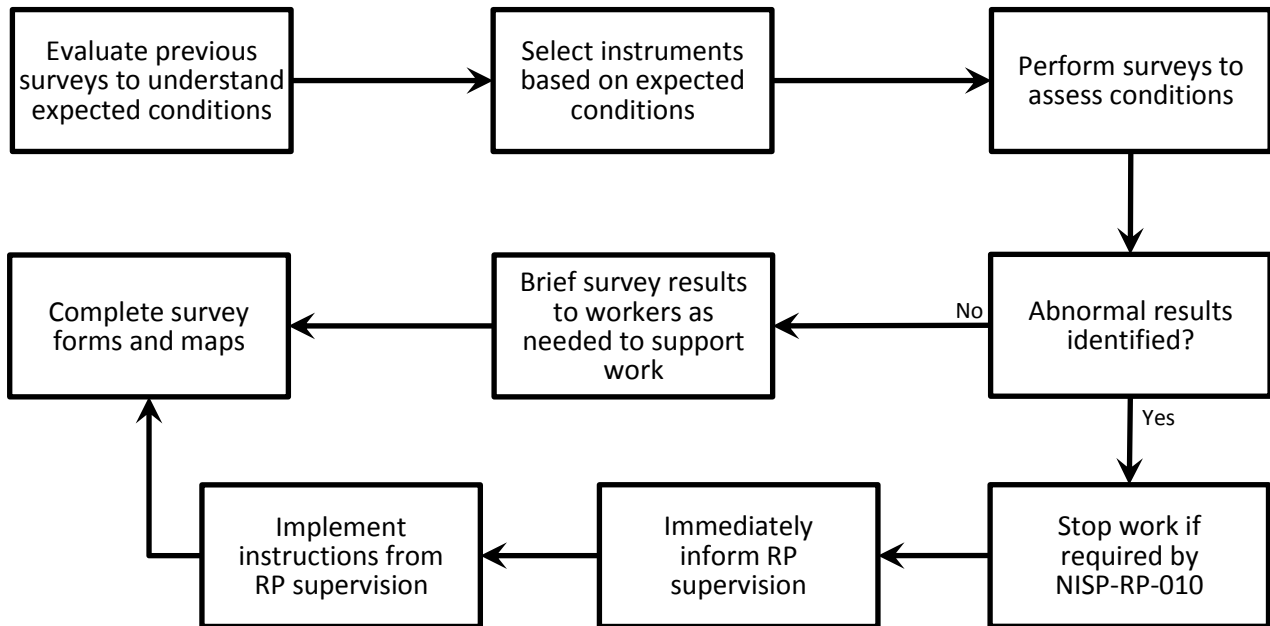
5.0 General Requirements

- 5.1 Prior to performing a survey, review the most current survey information for the expected plant conditions to:
 - 5.1.1 Understand the range of radiological conditions that can be expected.
 - 5.1.2 Obtain the most appropriate survey instruments.
 - 5.1.3 Identify where the highest dose rates and contamination levels may be located.
 - 5.1.4 Identify abnormal or changing conditions after completing the survey.
- 5.2 Surveys of radiation levels, surface contamination, and airborne radioactivity are required to:
 - 5.2.1 Evaluate the potential radiological hazards in the workplace.
 - 5.2.2 Inform workers on the radiological hazards to which they are exposed.
 - 5.2.3 Identify the presence of licensed radioactive material to ensure controls are established to minimize exposure to personnel and the public.
 - 5.2.4 Evaluate changes in radiological conditions due to work activities or changing plant conditions.
 - 5.2.5 Ensure compliance with NISP-RP-004, *Radiological Posting and Labeling*.
- 5.3 Site procedures establish the areas and frequencies for routine surveys.
 - 5.3.1 Survey frequencies for specific areas are based on the potential for changing radiological conditions and ALARA considerations.
 - 5.3.2 Routine surveys are performed to verify that radiological conditions have not extended into areas that are not posted and controlled.
 - 5.3.3 Routine verifications are performed to verify the integrity of Locked High Radiation Area barricades for preventing unauthorized access.
 - 5.3.4 Routine surveys are only performed in Locked High Radiation Areas if routine access is required or if directed by RP supervision.
 - 5.3.5 Tools and equipment are routinely surveyed and labeled per NISP-RP-004, *Radiological Posting and Labeling* to prevent unnecessary exposure to workers and to appropriately contain radioactive materials.

6.0 Process Instruction

NOTE: Instruments must be able to measure the types and magnitude of the radiation expected with consideration to minimizing the dose to the surveyor.

6.0.1 The diagram below shows the process steps used by RP technicians to perform radiological surveys, communicate the results, and document radiological conditions.



6.1 Survey Dose Rates in an Area

6.1.1 Minimize dose during the survey by considering use of the following:

- a. Using extendable probes to maintain distance from the source.
- b. Standing behind shielding materials or structures when possible.

6.1.2 Select and use portable survey instruments that are suitable to the specific job with respect to the type, energy, and range of the anticipated radiation fields and expected dose rates.

6.1.3 Set the instrument on a scale representative of expected dose rates prior to entering the area if the instrument does not have an automatic scaling feature.

- a. If entering areas with unknown dose rates, use the highest anticipated scale and adjust as needed.

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- 6.1.4 Extend the instrument in front of the body upon entering the area and slowly scan the work area and travel paths.
- 6.1.5 Measure contact and 30 cm dose rates from known and potential sources, e.g. pipes, elbows, valves, penetrations, spills, transfer lines, etc.
- 6.1.6 Measure dose rates approximately chest high to assess dose rates where dosimetry is normally placed.
- 6.1.7 If dose rates exceed 100 mrem/hour between the knees and the head close to a source of high radiation levels, determine if a dose rate gradient exists that may require relocation of the chest dosimetry or additional dosimetry as described in NISP-RP-010, *Radiological Job Coverage*.
- a. Identify the source of the high radiation levels, e.g. overhead piping, floor piping, or highly contaminated surfaces.
 - b. Measure dose rates at heights approximating a worker's knees, waist, chest, and head in close proximity to the source of high radiation levels where a worker may be positioned.
 - c. If the highest dose rate is not at chest level, record dose rates as follows:
 - Record the chest dose rate on the survey record along with the locations of higher dose rates.
 - Annotate each dose rate based on body location, i.e. knees, waist, chest, or head per Attachment 2.
- 6.1.8 Verify the adequacy of current postings and change postings as needed to comply with NISP-RP-004, *Radiological Posting and Labeling*.
- a. Notify RP supervision of any changes in area postings.
- 6.1.9 Compare measured dose rates to those stated in applicable RWPs and notify RP supervision if the actual dose rates deviate from the range recorded on an RWP.
- 6.1.10 Measure beta dose rates in known or suspected areas with contamination levels in excess of 500,000 dpm/100 cm², e.g. open primary reactor system components or drained radwaste tanks and reactor cavities.
- a. Scan the surface with an open window ion chamber instrument and obtain static measurements where the radiation levels are the highest.
 - b. Obtain a closed window (CW) and open window (OW) measurement as close to the surface as possible without contaminating the instrument.

- c. Calculate the beta dose rate by using the following formula:

$$\frac{mrad}{hour} = (OW - CW)(beta\ correction\ factor)$$

- d. The beta correction factor is provided by RP supervision; the factor may be located on the instrument calibration label.
- e. Also obtain CW and OW measurements at 30 cm and determine the gamma and beta dose rates as described above.

6.1.11 Survey areas greater than 7 feet above the floor only if ladders, scaffolds, or platforms are in place to gain access.

- a. Survey permanent installations and post per NISP-RP-004, *Radiological Posting and Labeling*.
- b. If access is allowed on a temporary installation without a prejob survey, place a survey tag at the base of the ladder such as that shown in Attachment 1.
- c. If a prejob survey is required for accessing a temporary installation, post or tag the base of the ladder to contact RP prior to entry.

6.1.12 Identify any areas with radiation streaming and evaluate the dose rates, the source, and the configuration.

- a. Notify RP supervision to assess the need for mitigating actions.

6.2 Directly Frisk a Surface

6.2.1 Select the appropriate instrument based on the following:

- a. Use a zinc sulfide or gas flow proportional detector to frisk for alpha.
- b. Use a pancake GM detector to frisk for $\beta\gamma$ emitters.

6.2.2 If verifying the absence of contamination, ensure background does not exceed the following:

- a. Less than 200 cpm to detect with a pancake GM detector.
- b. Background sufficient to meet required MDA of <20 dpm/100 cm² for alpha.

6.2.3 Slowly move the probe over the surface (e.g., 1 to 2 inches per sec) as closely as possible without contacting the surface (approximately ¼ inches for alpha detector,

approximately ½ inches for a GM detector). Upon noticing an increased count rate, perform the following:

- a. Stop the probe.
- b. Move the probe as close as possible to the area of interest.
- c. Observe the instrument reading long enough to determine the count rate above background (ncpm).
- d. Consider contamination as being present if the count rate is above background.

6.2.4 If the count rate exceeds 50,000 ncpm when frisking with a pancake GM detector, determine if the cause is a discrete radioactive particle (DRP) by the following method:

- a. Determine if the count rate rapidly drops as the probe is slowly moved approximately 1 inch from the centerline geometry. This is a characteristic of a DRP.
- b. Attempt to remove the DRP with tape or other suitable media and repeat the direct frisk after each attempt to determine if it has been removed.
- c. Verify if the particle has been isolated with the tape by frisking the tape.
- d. Notify RP supervision if a DRP was present.
- e. Ensure areas are posted for Discrete Radioactive Particles per NISP-RP-004, *Radiological Posting and Labeling*.

6.3 Perform a Smear Survey

NOTE: Department of Transportation (DOT) regulations require smearing a minimum of 300 cm² for shipment surveys. Refer to site specific procedures for required DOT surveys.

6.3.1 Wipe or rub a disc smear over a surface area of approximately 100 cm² using moderate pressure.

- a. If an object has less than 100 cm² of surface area, wipe all of the surface area.
 - Estimate the surface area and ratio to 100 cm² to document survey results in units of dpm/100 cm² OR

- Document the results as dpm/smear.

6.3.2 Smear enough locations to adequately assess the locations and quantities of surface contamination in the area.

- a. Number the smears and their location on the survey map.
- b. If a map or drawing is not available, record information sufficient to recall where each smear was taken.
- c. Comply with site procedures for smear surveys in Foreign Material Exclusion (FME) areas.

6.3.3 Take precautions to avoid cross-contaminating smears.

6.3.4 Analyze smears using one or more of the methods in section 6.6.

6.4 Perform a Large Area Smear Survey

NOTE: Large area smears (also called wipes or sweeps) provide a qualitative assessment that is used to verify the absence of removable contamination in a relatively large area; large area smears have a detection threshold but they are not used to quantify removable contamination levels.

6.4.1 Wipe one side of the survey cloth on the surface area as follows:

- a. Wipe floors with a cloth mop to obtain a representative sampling of the area.
- b. Wipe the entire surface of items such as boxes, containers, equipment, etc.
- c. Suspend wiping the surface if the survey cloth becomes wet or loaded with debris, dust, or dirt.
- d. Do not use wipes if the surface is so rough that the cloth is torn by rubbing it on the surface.
- e. Use multiple wipes as needed.

NOTE: The basis for the required surface area to smear and the detection threshold is explained in Reference 8.2.15.

- f. Wipe an area greater than 5 times the surface area of the wipe to achieve a detection threshold less than 1,000 dpm/100 cm² of loose surface contamination.

- 6.4.2 Directly frisk the surface of the wipe in an area where the background is less than 200 cpm.
- 6.4.3 If an increase above background is observed but the count rate is less than 100 ncpm, then take either of the following actions:
- Repeat wipes in the area until contamination is not detected above background.
 - Perform a smear survey to identify areas that need cleaning and initiate actions to clean affected areas.
- 6.4.4 If the direct frisk yields greater than 100 ncpm, take the following actions:
- Perform a disc smear survey (100 cm² smears).
 - As required, post the area in accordance with NISP-RP-004, *Radiological Posting and Labeling*.
 - Initiate actions for decontamination as desired for removal of Contaminated Area postings.
 - Record a survey to show the following:
 - The area that was smeared by the large area smear and subsequently posted.
 - The highest ncpm reading from the direct frisk of the large area smear.
 - Results from the follow-up smear survey (100 cm² smears).
 - Post-decontamination results to justify removal of Contaminated Area postings.
- 6.4.5 If an increase above background is not observed, the removable contamination levels are less than the detection threshold of 1,000 dpm/100 cm².

6.5 Survey for Discrete Radioactive Particles

- 6.5.1 Wipe the surface with a survey cloth or other tacky material where contamination levels are greater than 100,000 dpm/100 cm², i.e. a High Contamination Area.
- 6.5.2 Directly frisk the wipe material using the audible function if available to help discern quick increases and decreases in count rate.
- If available, use a collimator cover for the detector with a small hole or slit to help identify the exact location of the particle.

- 6.5.3 Attempt to isolate and contain the particle as described in section 6.2.4. If the particle cannot be removed, it is sufficiently entrained where it is located.
- 6.5.4 Survey the particle with an ion chamber instrument to obtain both closed window (CW) and open window (OW) measurements.
 - a. An OW/CW ratio less than 10 normally indicates a fuel fragment.
 - b. An OW/CW ratio greater than 30 normally indicates a corrosion product.
- 6.5.5 Ensure areas with discrete radioactive particles are posted and controlled per NISP-RP-004, *Radiological Postings and Labeling*.
- 6.5.6 Submit the particle for gamma spectroscopy analysis as directed by RP supervision.

6.6 Analyze Smears

CAUTION

Wet or oily smears can result in significant self-absorption of alpha particles. Dry wet smears prior to analysis using a method that will not result in losing contamination from the smear. Consult RP supervision for direction to analyze oily smears.

- 6.6.1 Analyze a smear using a pancake GM detector to measure $\beta\gamma$ emitting nuclides.
 - a. The detector may be connected to a rate meter or scaler.
 - b. Ensure background is less than 200 cpm if the purpose of the smear is to verify contamination levels are less than 1,000 dpm/100 cm².
 - c. Center the detector over the smear within ½ inch from the smear.
 - d. Subtract background from the gross count rate to obtain ncpm above background.
 - e. Divide the ncpm by the efficiency factor to obtain dpm/100 cm². Use an efficiency factor of 0.1 unless otherwise directed by RP supervision.
- 6.6.2 Analyze a smear using a portable ion chamber survey instrument to measure $\beta\gamma$ emitting nuclides.
 - a. Obtain closed window (CW) and open window (OW) measurements with the instrument as close to the smear as possible without contaminating the instrument.

- b. Calculate the beta dose rate by using the following formula:

$$\frac{mrad}{hour} = (OW - CW)(beta\ correction\ factor)$$

- c. The beta correction factor is provided by RP supervision; the factor may be on the instrument calibration label.
- d. The gamma dose rate is the closed window measurement.

6.6.3 Analyze smears for alpha as follows:

NOTE: When counting smears for alpha representative smears should be selected that are sufficient to adequately characterize the hazard by considering location, number of smears, and smears with higher beta/gamma activity as appropriate.

- a. For Alpha Level I Areas: Analyze at least 10%, or 3 at a minimum, of the smears with the higher contamination levels, when Beta/Gamma contamination $\geq 100,000$ dpm/100cm².
- b. For Alpha Level II Areas: Analyze at least 10%, or 3 at a minimum, of the smears with the higher contamination levels, when Beta/Gamma contamination exceeds 20,000 dpm/100cm².
- c. For Alpha Level III Areas, analyze at least 50% of the smears to evaluate the magnitude and extent of the alpha contamination.

6.6.4 Analyze smear samples for alpha using an instrument capable of quantifying alpha emission.

- a. The detector may be connected to a rate meter or scaler.
- b. Ensure background complies with posted limits to provide the required MDA value and to ensure light is not penetrating the zinc sulfide detector covering.
- c. Center the detector over the smear within ¼ inch from the smear without contacting the surface.
- d. Subtract background from the gross count rate to obtain ncpm above background.

- e. Divide the ncpm by the efficiency factor posted with the detector to obtain dpm/100 cm².

6.6.5 Analyze a smear using an automated smear counter.

CAUTION

Prevent contamination of smear counters by complying with site limits for the maximum amount of contamination that can be on a smear. Limits are based on the highest allowed cpm measurement from the smear using a frisker. Contact RP Supervision for alternative methods to analyze high activity smears.

- a. Achieve familiarity with operating the software for the smear counter.
- b. Ensure background is within posted parameters for the counter.
- c. Exercise extreme care in placing and removing smears in planchets to avoid contaminating the counter and detector, causing an increase in background.

6.7 Evaluate Alpha

6.7.1 If a smear has been analyzed for alpha, determine the $\beta\gamma/\alpha$ Ratio of each smear as follows:

$$\beta\gamma/\alpha \text{ Ratio} = \frac{\text{dpm of Beta Gamma Emitters}}{\text{dpm of Alpha Emitters}}$$

6.7.2 If the $\beta\gamma/\alpha$ Ratio is less than or equal to 30,000 and the total transuranic alpha activity is greater than or equal to 20 dpm/100 cm², verify the smeared location is properly posted as an Alpha Level 2 or 3 Area as required by NISP-RP-004.

- a. If the current posting does not sufficiently encompass the hazards from alpha, immediately take the following actions:
- Upgrade the posting consistent with NISP-RP-004, *Radiological Posting and Labeling*.
 - Notify RP supervision.

6.7.3 If the $\beta\gamma/\alpha$ Ratio is less than or equal to 50 and the total alpha activity is greater than or equal to 20 dpm/100 cm², verify that an alpha frisker is available and the area has been posted to require alpha frisking per NISP-RP-004, *Radiological Posting and Labeling*.

6.7.4 If the smear was taken on equipment or material removed from an area and the $\beta\gamma/\alpha$ Ratio is less than 300 and the total alpha activity is greater than or equal to 20 dpm/100 cm², take the following actions:

- a. Verify the container with the equipment or material is tagged “Level 3 Alpha Area” as required by NISP-RP-004, *Radiological Posting and Labeling*.
 - If the container tag has to be revised, immediately notify RP supervision.
- b. Verify the area from which the equipment was removed is posted as an Alpha Level 3 Area as required by NISP-RP-004, *Radiological Posting and Labeling*.
 - If the posting is not for an Alpha Level 3 Area, immediately upgrade the area posting and notify RP supervision.

6.8 Respond to Abnormal Survey Results

6.8.1 Immediately notify RP supervision for any of the following conditions:

- a. Changes in radiological conditions that require changes in postings or RWPs.
- b. Dose rates greater than the site limit outside an RCA.
- c. Discovery of radioactive material outside the RCA.

6.8.2 If the criteria in NISP-RP-010, *Radiological Job Coverage*, are met, stop work.

6.9 Document a Radiological Survey

NOTE: Programs and software used to document radiological surveys vary among plant sites. Surveyors must become accustomed to site expectations for using survey maps and software applications. The nomenclature described in Attachment 2 includes accepted industry standards.

- 6.9.1 Document survey results in a timely manner using site specific forms, maps and software with the symbols and abbreviations listed in NISP-RP-002, *Radiation and Contamination Surveys - Attachment 2*.
- 6.9.2 Annotate station unique symbols on surveys as appropriate. Common nuclear accepted acronyms and abbreviations do not need to be defined.
- 6.9.3 Ensure the recorded data provides sufficient detail to effectively communicate the radiological conditions within the surveyed area.
- 6.9.4 Evaluate the recorded information and posted conditions to ensure compliance with NISP-RP-004, *Radiological Postings and Labeling*.
- 6.9.5 Ensure radiological survey documents meet the following criteria prior to submittal for RP supervision review and approval:

- a. Hot Spots as defined in NISP-RP-004, *Radiological Posting and Labeling* are identified with contact and 30 cm measurements.
- b. Radiological postings as defined in NISP-RP-004, *Radiological Posting and Labeling*, are accurately aligned with the radiological measurements recorded on the survey.
- c. If a contaminated system was breached during the survey, measurements are provided for:
 - Contact and 30 cm gamma measurements on exposed system internals.
 - Contact and 30 cm beta dose rates if contamination levels exceed 500,000 dpm/100 cm².
 - Air sample results during the breach as required by RP supervision.
 - Smear results from the exposed internal surface.
 - Smear results from the area around the breached component.
- d. Posted boundaries are delineated and labeled with any changes identified and explained.
- e. Air sample results are provided as required for job coverage.
- f. Smear surveys are representative of the area to sufficiently assess general area contamination levels.
- g. The survey date, time, and location are clearly recorded.
- h. The survey instrument used is identified by a serial number.
- i. The RWP number is referenced if the survey was performed in support of an RWP.
- j. The surveyor's printed name and signature are recorded for hand written surveys.
 - Names and approvals for electronic survey systems are entered based on the software application in use.

7.0 Records/Documentation

- 7.1 Retain completed Attachments in accordance with the provision of the stations records management program.

- 7.2 Computer generated equivalents may be used in place of the Attachments provided that, at a minimum, the appropriate information contained on the Attachment is contained on the equivalent

8.0 References

8.1 Commitments

NONE

8.2 General

8.2.1 10 CFR 20, Standards for Protection Against Radiation

8.2.2 EPRI Alpha Monitoring and Control Guidelines for Operating Nuclear Power Stations, Revision 2.

8.2.3 INPO 05-008, "Radiological Protection at Nuclear Power Stations"

8.2.4 NISP-RP-003, Radiological Air Sampling

8.2.5 NISP-RP-004, Radiological Posting and Labeling

8.2.6 NISP-RP-010, Radiological Job Coverage

8.2.7 NISP-RP-013, Radiological Protection Glossary

8.2.8 NISP-101, Self Protection Worker (SPW) Program

8.2.9 Blue L. Detection Threshold of Large Area Wipes. Health Phys Op Rad Safety 106(Supp 2): S5-S11; 2014.

9.0 Attachments

9.1 Attachment1: Temporary Survey Tag – Example

9.2 Attachment 2: Radiological Survey Map Symbols & Abbreviations

**ATTACHMENT 1
Temporary Survey Tag – Example
Page 1 of 1**

Temporary SURVEY TAG

Location: _____

Unit: _____ Bldg: _____ Elev: _____

Row: _____ Column: _____

Dose Rates (mrem/hour)

Highest Contact: _____

Highest 30 cm: _____

Work Area: _____

Contamination (dpm/100 cm²)

Maximum: _____

General Area: _____

Comments: _____

Initial Surveyor (Print Last Name & Date)

Survey Updates (Print Last Name & Date)

ATTACHMENT 2
Radiological Survey Map Symbols & Abbreviations
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Survey information in the form of maps, signs, radiation work permits (RWPs), or status boards should be readily available via computer or at the RCA access area and, as appropriate, at the entrances to work areas. The information should be up to date, clearly written and displayed in format that is easily understandable by workers. Radiological survey information should provide workers with a clear understanding of the hazards and low-dose zones in their work areas. Date the survey information so radiological protection technicians and workers can evaluate its applicability based on known system changes. Workers review this information, attend prejob briefings, or self-brief for low radiological risk activities that include appropriate survey information, and use the information to control their doses.

Consistent radiological survey symbols enhance the radiation worker's and radiation protection technician's ability to interpret surveys and identify hazards. Standardized survey symbols reduce training needs for traveling workers and radiation protection technicians.

Whole Body Dose Rates

Record chest high dose rates at the approximate locations of the measurements. No additional symbols or annotation is required unless the measurement is for a dose rate gradient.

Record measurements of a dose rate gradient identifying the source of the gradient, the location of the highest radiation levels, and noting the approximate measurement heights as follows:

- Knees
- Waist
- Chest
- Head

Symbols

Δ – Indicates air sample data. The type of A/S may be designated by placing a letter inside the “Δ” (except for breathing zone air samples it is assumed the others are general area air samples).

- Particulate A/S is designated by placing a “P” inside the “Δ”.
- Iodine A/S is designated by placing an “I” inside the “Δ”.
- Noble Gas A/S is designated by placing an “G” inside the “Δ”.
- Breathing Zone A/S is designated by placing a “BZ” inside the Δ.

O – Indicates contamination data. A number should be placed inside the “O” corresponding to referenced smear location.

***# / #** – Indicates contact and 30 cm gamma dose rate readings; where the numerical value with the asterisk shall display the contact gamma dose rate and the second numerical value shall display the 30 cm gamma dose rate.

HS – Indicates a hot spot. Contact and 30 cm dose rate (same format as above) of the hot spot may be placed adjacent to the HS.

N – Indicates dose rates due to neutron radiation.

- 50N indicates 50 mrem/hr general area due to neutron radiation.

B – Indicates the dose rate due to beta radiation, applying a beta correction factor.

- 50 β indicates 50 mrad/hr corrected beta dose rate; contact and 30 cm readings should be displayed using the same format as above

**ATTACHMENT 2
Radiological Survey Map Symbols & Abbreviations
Page 2 of 2**

XXX or ----- – Designates a radiological area boundary. Used in conjunction with RCA, RA, HRA, LHRA, VHRA, ARA, CA, HCA, RMA, etc.

Additional Information

Other information displayed on radiological postings such as “keep out” or a range of gamma dose rates found in the area may be added. Other information should be standardized as follows:

- “KO” for keep out
- “NRP” for notify RP prior to entry
- “LDWA” for low dose waiting area
- A rectangle with the letters “SOP” shall be placed at the entrance to a contaminated area to designate a step off pad

Radiological Units

- “mR/hr or mrem/hr,” or unit variations, should be used to designate dose rates due to gamma radiation.
- “mrad/hr” should be used to designate dose rates due to beta radiation.
- “N” for dose rates due to neutron radiation in mrem/hr.
 - 50 N indicates 50 mrem/hr general area due to neutron.
- Percent DAC should be used when designating the airborne radioactivity in an area.
- “dpm/100 cm²” should be used when designating the contamination level in a specific location using a standard disc smear.
- “<1,000 dpm/100 cm²” should be used to record large area smear results if direct frisking of the smear did not yield ≥ 100 ncpm.
- “ncpm / LAS” should be used when designating the contamination level if a direct frisk of the large area smear yielded ≥ 100 ncpm. The abbreviation, LAS, should be spelled out on the survey map.
- “mrad/hr/100 cm²” should be used when designating the contamination level in a specific area that has been determined using a dose rate meter and a standard disc smear or “mrad/hr/LAS” if an area larger than 100 cm² was surveyed.
- “K” should be used for thousands of dpm; for example 1K dpm/100 cm² is equal to 1000 dpm/100 cm².
- “ND” (non-detectable) or “<ND dpm/100 cm²” should be used when contamination is below detectable levels.