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SAFETY POLICY & PROCEDURE

Ionizing Radiation

SPP# 1910.1096

Quick Reference

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Special Notice:

SPP# 1910.96 Ionizing Radiation and revisions are cancelled as of this date. Appropriately destroy all hard copies which shall be replaced with SPP# 1910.1096 Ionizing Radiation in accordance with OSHA General Industry Standards.

Information Security. N.C.G.S.104E-9(a)(4) outlines authority to withhold information from public disclosure as defined by this and other N.C.G. Ss, except to individuals with a need to know. The Materials and Test (M&T) Unit, Radiation Safety Officer (RSO), Director, Safety and Risk Management (SRM) and Communication, NCDOT will coordinate and forward request by public for agency radioactive material information to the Radiation Protection Section, North Carolina Department of Health and Human Services, (RPS-NCDHHS) for approval to release information and/or directed response from RPS-NCDHHS.

1.0 Purpose

The purpose of this Safety Policy and Procedure (SPP) is to establish guidelines for radiation protection and safety of North Carolina Department of Transportation (NCDOT) employees.

2.0 Scope and Applicability

Radiation is a form of energy. Ionizing radiation has very damaging effects on skin tissue and can serve as a precursor to several forms of cancer. Materials and Test Unit's Nuclear Density gauges are the primary radiation source in NCDOT.

This SPP provides guidelines for the safe handling of Ionizing Radiation. It includes provisions for training, description of ionizing equipment used in NCDOT, and the necessity of warning signs for restricted areas. Additionally, it includes discussion on the monitoring of personnel for ionizing radiation exposure and the reporting of ionizing radiation overexposure.

This document also details the areas of responsibility for M&T Unit, managers/unit heads, supervisors, employees, SRM, and Division Safety Staff within NCDOT.

The M&T Unit, NCDOT is the designated custodian of nuclear density gauges for this Agency responsible for Program Management, Security, Recordkeeping, Training, Leak Testing, Personnel Monitoring, Exposure Reporting Procedure, Emergency Procedures, Loss/Theft/Damage/Misplacement Reporting, Inspections, Compliance, Etc....

This SPP affects any employee who because of their job duties will handle and operate equipment producing or containing ionizing radiation sources. Specifically, this safety policy and procedure affects Materials and Tests Unit employees who use, maintain, and transport nuclear density gauges and field construction employees assigned to projects as nuclear gauge operators.

3.0 Reference

This SPP is established in accordance with Occupational Safety and Health Standards for General Industry and the below listed standards, regulations, guidelines, applicable statutes, laws, manufactures Instructions, this should not be considered an all-inclusive list.

10 CFR 20	Standards for Protection Against Radiation	Nuclear Regulatory Commission
29 CFR 1910.1096	Ionizing Radiation	Occupational Safety and Health Administration (OSHA)
29 CFR 1926.53	Ionizing Radiation	OSHA
N.C.G.S. Chapter 104E	North Carolina Radiation Protection Act	NC General Assembly
13 NCAC 07	Office of Occupational Safety and Health	NC Department of Labor (NCDOL)

10 NCAC 15	Radiation Protection Section	NC Department of Health and Human Service (NCDHHS)
Regulations/Guidelines/Information	Radioactive Materials Section http://www.ncradiation.net	Radioactive Materials Section (RMS)-NCDHHS
Radioactive Materials License	092-0104-1	Division of Highways, NCDOT and RMS-NCDHHS
Manufacture Instructions and Manuals	Item/s by Manufacture	Specific Manufactures Guidance

4.0 Policy

It is the policy of NCDOT to provide a place of employment that is free from recognized hazards that cause or are likely to cause death or serious physical harm to employees or the public. Therefore, unauthorized handling of radiation sources is strictly prohibited. When radiation hazards exist that cannot be eliminated, then engineering practices, administrative practices, Personal Protective Equipment (PPE), safe work practices, and proper training regarding Ionizing Radiation will be implemented. These measures will be implemented to minimize those hazards to ensure the safety of employees and the public.

5.0 General Responsibilities

It is the responsibility of each manager/unit head, supervisor, and employee to ensure implementation of NCDOT's policy on Ionizing Radiation. It is also the responsibility of each NCDOT employee to report immediately any unsafe act or condition to their supervisor. Specific responsibilities are in Section 6.3.

6.0 Procedure

This section provides applicable definitions, establishes general provisions, and identifies specific responsibilities required by NCDOT's policy on Ionizing Radiation.

6.1 Definitions

Dose

The quantity of ionizing radiation absorbed, per unit of mass, by the body or by any portion of the body.

Film Badge or Dosimetry

Uses optically stimulated luminescence technology with an aluminum oxide- based detector. Radiation exposure is measured by scanning the dosimetry.

Ionizing Radiation

Electromagnetic or particulate radiation capable of producing ions, directly or indirectly, by interaction with matter.

Nuclear Density Gauge

A piece of equipment with a radioactive source used for density measurements of asphalt, aggregate base course and concrete.

Radiation

Includes alpha, beta, gamma, x-rays, neutrons, electrons, protons, and other atomic particles. This term does not include sound or radio waves, or visible light, or infrared or ultraviolet light.

Radioactive Material

Any material which emits, by spontaneous nuclear disintegration, corpuscular or electromagnetic emanations.

Restricted Area

Any area to which access is controlled by M&T Unit, NCDOT for purposes of protection of individuals from exposure to radiation or radioactive materials.

Radiation Safety Officer (RSO)

An RSO is an individual appointed in writing by the licensee (NCDOT), to be responsible for implementing the radiation protection program. The licensee, through the RSO, shall ensure that radiation safety activities are being performed in accordance with licensee-approved procedures and regulatory requirements. A licensee's management may appoint, in writing, one or more Associate RSOs (ARSO) to support the RSO. The RSO, must assign the specific duties and tasks to each ARSO which are restricted. The RSO may delegate duties and tasks to the ARSO but shall not delegate the authority or responsibilities for implementing the radiation protection program.

6.2 General Provisions

This section details the provisions of this safety policy and procedure with each provision discussed in a separate subsection. These provisions are:

- Training
- Equipment
- Warning Signs
- Personnel Monitoring
- Recordkeeping
- Exposure Reporting Procedure
- Emergency Procedures
- Equipment Security, Damage, Loss, Theft, Misplacement Reporting
- Audits and Inspections

6.2.1 Training

Materials and Tests Unit shall train employees affected by this SPP. The M&T Unit shall certify as nuclear gauge operators those affected employees and will train other employees who handle nuclear gauge equipment. Nuclear gauge operators and other employees may be required to complete other training on associated equipment and other job-related duties. Successful completion of the following classroom and field training is required to become a certified nuclear gauge operator:

Topic	COURSE #	Course Covers
Initial Course	MAT-250 Nuclear Safety and Hazardous Materials	Initial Training Awareness and Information Training
Base Course Type Materials (i.e. ABC, CTBC, FDR, etc.)	MAT 370 - Nuclear Density Testing	Base, FDR, and Select Materials
Field Certification	Field Certification	M&T staff provides one-on-one field training and observation
Asphalt Materials	MAT 380 - Density Gauge Operator	Equipment use and information
Field Certification	Field Certification	M&T staff provides one-on-one field training and observation

Material & Testing Unit staff is responsible for all radiation safety training and training documentation. Future training packages and additional recordkeeping may be included in the Learning Management System (LMS).

Nuclear Gauge Refresher Training is required every three years (triennially) for any DOT employee actively receiving a film badge, unless directed to be conducted sooner.

Additional information regarding training classes is provide at the following M&T website: <https://connect.ncdot.gov/resources/materials/Pages/default.aspx>

6.2.2 Equipment

Nuclear Gauge are the primary piece of ionizing equipment used within NCDOT. Nuclear Gauges are used to determine the density of asphalt and aggregate base course. The radioactive material used to perform these tests is in pellet-form, encapsulated inside the equipment.

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Nuclear Gauges must be leak tested every 12 months in accordance with our licensing agreement with the North Carolina Radiation Protection Section.

Materials and Tests Unit will maintain records of all NCDOT Nuclear Gauges in receipt of/transferred to or from/ Disposed of/Procured/Leak Testing/Repairs regardless, of how acquired Owned/ Rental/ Lease. Records must be maintained 5 years after appropriate disposal.

Figures 1, 2, and 3 – Sample Nuclear Gauges Photos



Figure 1 - Humboldt Nuclear Gauge

Figures 2 & 3 - Toxler Nuclear Gauges

6.2.3 Warning Signs/Employee Notice Posters

Any facility storing Nuclear Gauges *shall* have signs outside the restricted area notifying employees of the potential dangers. These signs shall contain the standard radiation symbol with the conventional radiation caution signage. When storing in magazines magnetic signs are permitted.

Notice to Employee Poster (Appendix A) must be posted in a sufficient number of places in every establishment where employees perform activities regulated by NC Radiation Protection; to permit employees working in or frequenting any portion of a restricted or controlled area to observe a copy on their way to or from their place of employment.

Figure 4 shows sample Radiation Caution Sign and Notice to Employee Poster.



Figure 4

6.2.4 Personnel Monitoring

All employees who use the Nuclear Gauge will always wear film badges to monitor the amount of radiation to which they may be exposed. Film badges are assigned to a specific person and cannot be shared among individuals. These badges are part of a continuous monitoring program and are replaced quarterly.

Materials and Tests Unit will maintain records of the replacement/testing result of all film badges. See Figure 5 – Sample Film Badge Photo.



Figure 5 – Film Badge

6.2.5 Recordkeeping

Materials and Tests Unit, NCDOT shall maintain records of exposures for employees who are required to wear film badges. Materials and Tests Unit shall disclose exposures to employees upon request from the employee. These records of exposures shall be maintained for a period not less than 30 years from the termination of employment with NCDOT.

6.2.6 Exposure Reporting Procedure

For employees not protected by the NRC, all exposures over the allowable threshold limits shall be reported to the NC Commissioner of Labor or their duly authorized representative. In addition, exposure notification in writing shall be submitted to the NC Commissioner of Labor or the duly authorized representative within 30 days of the original exposure date. A record of all radiation exposures must be made available to future employers at the request of former NCDOT employees. The Director, SRM shall be notified in these cases.

6.2.7 Emergency Procedures

Written emergency procedures for nuclear equipment accidents are maintained by M&T Unit as required by license issued by North Carolina Radiation Protection Section (NCRPS). The Director, SRM shall be provided a copy of these emergency procedures.

6.2.8 Security and Reporting Damage, Loss, Theft, Misplacement

Key control is limited to individuals authorized by the RSO.

Nuclear gauge storage facilities must be secure with access limited to authorized personnel. The following individuals should have access to nuclear gauge storage: Certified nuclear gauge operators, M&T Staff, and Resident Engineer.

Field offices assigned a nuclear gauge must designate a certified nuclear gauge operator to perform a weekly security check on assigned nuclear gauge(s). This process requires visually verifying a nuclear gauge is secure and properly stored.

Each security check must be documented on the utilization log sheet (including name and date). A legible copy of the log sheet(s) must be sent to the M&T Unit with the film badge package when returning used badges.

Immediately report evidence of any issues or security concerns to the M&T Staff listed on the emergency procedures, supervisor, and Director, SRM.

6.2.9 Audits and Inspections

Weekly security check noted on daily utilization log sheet must be maintained for three (3) years after a copy is submitted to the M&T Unit. Scanning and maintaining logs electronically is permissible provided the scanned copy is legible.

Announced audits/inspections may be conducted by RSO, NCDOL, NPS-DHHS, and NRC. Safety Staff should accompany inspectors to learn process. Copy of inspections record to Director, SRM.

Unannounced audits/inspections may be conducted by RSO, NCDOL, NPS-DHHS, and NRC. Safety Staff should accompany to learn process. May be conducted without RSO presence. Copy of inspections record to Director, SRM.

Properly trained and assigned M&T Staff will perform semi-annual physical inventories of all nuclear gauges during June and December per the RADIOACTIVE MATERIALS LICENSE. During the inventory process, storage locations are inspected to verify compliance. The Radioactive Materials License requires completion of a documented physical inventory of all every 6 months.

6.3 Specific Responsibilities

6.3.1 Managers/Unit Heads

Managers/Unit Heads will be responsible for identifying the employees affected by this SPP. Managers/ Unit Heads will also ensure compliance with this SPP through their auditing process.

The licensee shall institute the provisions of 10A NCAC 15 .1610 when an occupationally exposed woman voluntarily informs her supervisor, in writing, of the pregnancy and the estimated date of conception. The Supervisor's response and actions must be appropriately documented. Both the individual's voluntary information disclosure and Supervisor's response/s must be protected from unauthorized disclosure/release since potentially they may contain Protected Health Information under HIPAA (Health Insurance Portability and Accountability Act). Additionally, this is a personal matter.

6.3.2 Supervisors

Supervisors will ensure that affected employees are trained in the safe use and handling of equipment, instruments or sources which contain ionizing radioactive materials.

The licensee shall institute the provisions of 10A NCAC 15 .1610 when an occupationally exposed woman voluntarily informs her supervisor, in writing, of the pregnancy and the estimated date of conception. The Supervisor's response and actions must be appropriately documented. Both the individual's voluntary information disclosure and Supervisor's response/s must be protected from unauthorized disclosure/release since potentially they may contain Protected Health Information under HIPAA (Health Insurance Portability and Accountability Act). Additionally, this is a personal matter.

Due to added safety concerns and restrictions during pregnancy, M&T requires reassignment of job duties regarding use of a nuclear gauge when a woman declares a pregnancy. Radiation exposure to an unborn fetus must be strictly monitored and controlled. A temporary job duty reassignment for the duration of the pregnancy is the most effective control method.

6.3.3 Employees

Employees shall not operate any equipment without the proper training. Employees shall not operate any equipment or instrument which is damaged or in any other way malfunctioning. Employees will immediately inform their supervisor if any unsafe condition occurs (e.g., leaks, damage, theft, loss, or misplacement).

Additionally, employees shall not remove or otherwise modify any part of any instrument except to perform allowed routine maintenance or service. Employees shall wear film badges as prescribed.

The licensee shall institute the provisions of 10A NCAC 15 .1610 when an occupationally exposed woman voluntarily informs her supervisor, in writing, of the pregnancy and the estimated date of conception.

6.3.4 Safety and Risk Management

Safety and Risk Management will provide prompt assistance to managers/unit heads, supervisors, or others as necessary on any matter concerning this SPP.

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Additionally, NCDOT assign Safety Engineers, Consultants, or Officers will provide consultative and audit assistance to ensure effective implementation of this SPP.

6.3.5 Materials and Test Unit

Materials and Tests Unit will provide guidelines for the safe transport of nuclear gauges or other related equipment containing radioactive materials. Materials and Tests Unit will coordinate all training with the North Carolina Radiation Protection Section for the affected employees.

Materials and Test's Radiation Safety Officer must be designated in writing and is responsible for maintaining and updating the radiation license from the Radiation Protection Section with copy forwarded to Director, SRM.

6.4 Reporting Safety Concerns

ANYRISK is a safety reporting tool for NCDOT personnel. NCDOT Employees may report safety concerns anonymously, if desired (24/7/365) to:

1. <https://connect.ncdot.gov/anyrisk>
2. 1-866-361-1818

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Appendix A: Radiation Notice to Employees Poster



NC DEPARTMENT OF
**HEALTH AND
HUMAN SERVICES**
Division of Health Service Regulation

NOTICE TO EMPLOYEES

Standards for Protection Against Radiation; Notices;
Instructions and Reports to Workers; Inspections



EMPLOYEE'S RESPONSIBILITY AS A WORKER:

Familiarize yourself with the provisions of the radiation protection regulations and operating procedures that apply to the work in which you are engaged. Observe those provisions for your own protection, the protection of your co-workers and others. If you observe conditions which may lead to violations or have a safety concern, promptly report them to your supervisor.

WHAT IS COVERED BY THESE REGULATIONS?

1. Limits on exposure to radiation and radioactive materials in restricted and unrestricted areas;
2. Measures to be taken after accident exposure;
3. Personnel monitoring, surveys, and equipment;
4. Caution signs, labels and safety interlock equipment; and
5. Exposure records and reports.

YOUR EMPLOYER'S RESPONSIBILITY:

1. Comply with the requirements of North Carolina Regulations for Protection Against Radiation 10A NCAC 15 pertaining to work involving sources of radiation; departmental orders and registration or licensing conditions;
2. Post or otherwise make available to you a copy of the North Carolina Regulations for Protection Against Radiation 10A NCAC 15, certificates, registrations or licenses and the operating procedures that apply to the work you perform, and explain those provisions to you;
3. Post Notices of Violation involving radiological working conditions and orders.
4. Provide adequate radiation safety training to you, including the use of radiation producing devices or radioactive materials you may be expected to use.
5. Keep your radiation exposure as far below the maximum allowable limits as is "reasonably achievable."
6. Provide you with information on your exposure to radiation.

REPORTS ON YOUR RADIATION EXPOSURE HISTORY

Your employer is required to maintain records of your exposure to radiation as required by 10 CFR 20.2106. Your employer is required to provide you with written notification or a report of your exposure history under 10 CFR 19.13 if:

1. Your dose exceeds 100 millirem TEDE or 100 millirem to any organ or tissue over the monitoring year, or if you request your annual dose.
2. You receive an exposure in excess of the annual dose limits. Your employer is required by 10 CFR 20.2205 to give you this report within 30 days of the discovery of the exposure exceeding the dose limits. The exposure limits for occupational workers are found in 10 CFR 20.1201.
3. You are no longer employed by the licensee, and you request your exposure history from your former employer. 10 CFR 19.13(e) requires your former employer to provide you with this report within 30 days of your request, or 30 days after your dose is determined, whichever is later.

POSTING REQUIREMENT

Copies of this notice must be posted in a sufficient number of places in every establishment where employees perform activities regulated by NC Radiation Protection; to permit employees working in or frequenting any portion of a restricted or controlled area to observe a copy on their way to or from their place of employment.

INSPECTIONS

All licensed or registered activities are subject to inspections by representatives of the NC Department of Health and Human Services. During inspections, agency inspectors may confer privately with workers; and workers may bring to the attention of the inspectors any past or present condition which they believe contributed to or caused any violation as described above. The employer must not prevent you from talking with an inspector. If you believe your employer has not corrected violations involving radiological working conditions, you may request an inspection. The request must specify exactly what is wrong and must be signed by the worker or worker representative. The agency will make all reasonable efforts to protect your identity where appropriate and possible.

REPORTING SAFETY CONCERNS

Inquiries dealing with the matters outlined above are to be made to the Radiation Protection Section. Agency representatives may be reached during normal weekday work hours (8 a.m. – 5 p.m.) **by phone at (919) 814-2250 or by mail to: Section Chief, NC Radiation Protection, 5505 Creedmoor Road, Suite 100, 1645 Mail Service Center, Raleigh, NC 27699-1600.**

RADIOACTIVE MATERIALS BRANCH INCIDENT 24 HOUR EMERGENCY LINE:

(919) 602-7151.

After normal hours, calls may be directed to the
NC Emergency Management Operation Center at
(800) 858-0368.

EMPLOYMENT DISCRIMINATION

The North Carolina Employment Discrimination Bureau (EDB) enforces the Retaliatory Employment Discrimination Act (REDA). Employees who have questions about the application of REDA or employees who believe they have been discriminated or retaliated against, should contact the EDB information officer. They will advise you of the proper procedures to file a complaint. You may contact them by sending mail to N.C. Department of Labor, Employment Discrimination Bureau, 1101 Mail Service Center, Raleigh, NC 27699-1101 or by fax at (919) 807-2824 or by phone at (800) 625-2267 or fax (919) 807-2856. That website is <http://www.nclabor.com>.

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