# CAROLINA FAMILY HEALTH CENTERS, INC.
# PROCEDURE

**TITLE:** RAD-100.01 Radiation Protection Plan

**EFFECTIVE DATE:** October 2016

**SECTION:** Radiology
**REFERENCE POLICY:** RAD-100 Radiation Program

**RESPONSIBLE CHIEF OF STAFF:** Chief Compliance Officer
**RESPONSIBLE COMMITTEE:** Central-Compliance

**REVIEWED:** 09/20/2016, 11/28/2018, 6/12/2023, 05/13/2024, 04/14/2025

## I. PURPOSE

The purpose of the Radiation Protection Plan is to establish procedures to minimize radiation exposure of personnel and patients without sacrificing diagnostic quality and to comply with the North Carolina Department of Health and Human Services, Division of Health Services Regulation, Radiation Protection Section regulation 10A NCAC 15. This plan is reviewed and updated annually. **[.1603]**

## II. PROCEDURE

A copy of the state regulations entitled the *North Carolina Regulations for Protection Against Radiation 10A NCAC 15 (NCRFPAR)* is available for staff to review. It is available onsite at each facility that performs x-rays and is attached to this document (see attachment), which is available on the Carolina Family Health Centers, Inc. (CFHC, Inc.) intranet. The NCRPAR is also available at https://radiation.ncdhhs.gov/regs.htm. **[.1603]**

The following CFHC, Inc. locations have x-ray facilities:

- Carolina Family Dental Center (CFDC)
- Wilson Community Health Center (WCHC)
- Harvest Family Health Center (HFHC)
- Carolina Family Mobile Unit (CFMU)

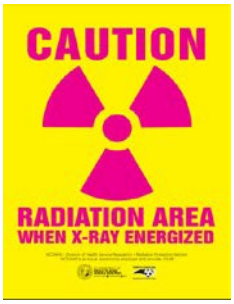
The following records concerning the equipment are kept indefinitely and are found in the Radiology Handbook(s) in the office of the Chief Dental Officer (CDO) at CFDC, in the locked document cabinet in the CFMU, and in the radiology workstation at WCHC and HFHC:

1. Shielding Plan reviews
2. Letter of Acknowledgement
3. Current Notice of Registration (NOR) of radiation equipment
4. Changes in the notification of registration of radiation equipment, as applicable
5. Post-installation survey
6. Waivers acknowledging exemption from the Radiation Protection Section regarding the Nomad Pro Handheld X-Ray System for Intraoral Imaging (Dental Only)
7. Form FDA 2579 – Report of Sale/Installation Report
8. A current copy of the *NCRFPAR*

9. Technique chart for each diagnostic x-ray unit, if not available on the equipment computer display
10. Records of maintenance, modification of equipment, and calibration records
11. Personnel monitoring and exposure records, including notification if occupational doses exceed 1 mSv (100 mrem) TEDE or 1 mSv (100 mrem) to any individual organ or tissue
12. *Notification to Employees* (see attachments)
13. Employee training records
14. A copy of this Plan

## Unit Security and Signage

CFHC, Inc. posts caution signs in a conspicuous manner in each radiation area that bears the approved radiation symbol and language. Unauthorized staff are not allowed in these areas. **[.1623 & .1624]**





CFHC, Inc. provides the *Notice to Employees* as provided and required by the NC Department of Health and Human Services. The notice is included as an attachment to this document and is available to all staff on the intranet. Staff working in the radiology program sign the *Notice to Employee Acknowledgement* (see attachment) upon hire, documenting their receipt of the Notice.

Radiation equipment is installed following the manufacturer's specifications. Staff do not alter, tamper with, or remove any of the filters or collimators, or in any way cause unnecessary radiation exposure.

CFHC, Inc. has security cameras to monitor the outside perimeter of each of its facilities. Outside doors are locked at the end of each day, and security codes are utilized to prevent unauthorized access to the facilities and to notify the security company/law enforcement of a breach. During operations, each facility has on-site security guards to monitor for unauthorized access or removal of radiology equipment. Visitors must sign in with the security guard and state the purpose of their visit. Refer to *OPR-200 Access to Secured Areas*. The doors to the dedicated spaces that house x-ray units are locked by the staff when the room is not in use and at the end of each day.

## Radiation Safety Officers

CFHC, Inc. appoints a Radiation Safety Officer (RSO) for the dental and medical departments. The RSOs have the responsibility and authority to oversee matters relating to radiation protection and ensure that radiation safety activities are being performed in accordance with approved policies, procedures, and regulatory requirements at CFHC, Inc. Refer to *RAD-100.02 Radiation Safety Officers*.

## Principles of ALARA (As Low As Reasonably Achievable) [.0603(1)(d) & .1603]

It is important to remember that there is no safe level of radiation dose. Damages from radiation increase proportionally as the dose level increases; therefore, all exposures carry a risk of damage to a biological system. In order to keep exposures as low as reasonably achievable, CFHC, Inc.'s employees protect themselves, the patient, and the public in the following ways:

a. The operator stands behind the protective barrier, as applicable.
b. The operator visually controls the area and verifies that hallways and other areas are clear in order to protect others from scatter radiation.
c. All appropriate doors are closed and appropriate shields are used during x-ray operation as documented in the operating procedures and shielding plan.
d. Cone positioning is adjusted to ensure that no beam is aimed at a non-shielded area.
e. Walls, floor, and ceiling areas exposed to the useful beam are constructed in accordance with regulatory requirements to provide appropriate protection to employees taking x-rays.
f. Employees are made aware of their own accumulated dose as registered on their radiation badge or as accumulated from a prior or an additional employer. Based on accumulated exposures, duties may be reassigned to prevent further exposure.
g. The fastest image receptors are used to obtain radiographic images. CFDC utilizes indirect digital sensors (phosphor storage plates) as image receptors.
h. Employees follow proper exposure and processing techniques.
i. Lead aprons are used to protect staff and patients.
    a. Lead aprons with thyroid collars are used on the involved patients and staff members for all intra-oral exposures
    b. A lead apron with a thyroid collar is used on the involved patient during panoramic exposures.
j. Radiographic examinations are ordered by staff licensed and privileged to make such determinations, are based on the patient's individual needs, and are ordered in accordance with the guidelines provided by the American Dental Association and/or accepted standards of care.
k. Exposure time is adjusted according to patient size. Patients of a smaller size (e.g., children) receive a lower exposure time.
l. All equipment is maintained in good operating order. Maintenance and calibration records are retained in the Radiation Handbook(s) for the lifetime of the equipment.

For stationary diagnostic systems, structural shielding is provided in the following ways:

a. All wall, floor, and ceiling areas exposed to the useful beam have primary barriers. Primary barriers in walls extend to a minimum height of 84 inches above the floor.

b. Secondary barriers in the wall, floor, and ceiling areas do not have a primary barrier or where the primary barrier requirements are lower than the secondary barrier requirements.
c. A window of lead-equivalent glass equal to that required by the adjacent barrier or a mirror system is installed. The window is large enough and so placed that the operator can see the patient without having to leave the protected area during exposures. The operator watches through the window behind the protective barrier wall while exposing a Panoramic x-ray.

## Auxiliary Support for Patients and/or Film

When a patient or film must be provided with auxiliary support during a radiographic exposure:

a. Mechanical Holding devices and/or restraint systems are used whenever medical circumstances permit, including but not limited to digital sensor holders, radiolucent sponges, or Pigg-O-Stat.
b. If a human holder is required, safety instructions are provided to the holder.
c. The human holder is protected from the primary beam by at least .05mm of lead equivalency, and from scatter radiation by at least o.25mm of lead equivalency. Every effort is made to position the holder so that the primary beam will strike no part of the body.
d. No individual is used routinely to hold patients or films.
e. Lead aprons are provided for both the holder and the patient.

Pediatric immobilizer instructions (Pigg-O-Stat)

a. Set proper technique controls and position the tube.
b. Remove all clothing other than diapers from the child receiving the x-ray examination.
c. Open supports on the pediatric immobilizer. Keep the seat as low as possible with the mouth of the child up to the level of the opening in the front supports.
d. Place the child on the seat and instruct someone to hold the child's arms in a vertical position, touching the ears and firmly immobilizing the head between the arms.
e. Adjust the supports firmly against the child and fasten the locks on the bases and straps at the top of the supports. Fasten the strap at the bottom of the support. Adjust the child as needed for proper positioning.
f. Have the patient well immobilized before permitting the assistant to release the patient's arm and head.
g. Avoid using the device on the patient if it is too large.

## X-ray Operators Certification and Training

Only individuals certified or otherwise recognized by the state of North Carolina may operate x-ray equipment. The individuals authorized to operate x-ray equipment at CFHC, Inc. include:

a. All dentists and dental hygienists with a current and unrestricted North Carolina license,
b. Certified dental assistants (successfully complete the Dental Assisting National Board exam),
c. Dental assistants who can show evidence of satisfactory performance on an equivalency examination, recognized by the North Carolina Board of Dental Examiners, based on

seven hours of instruction in the production and use of dental x-rays and an educational program of not less than seven hours in clinical dental radiology. Documentation is maintained by Human Resources.

d. Registered radiology technicians (RT-R)
e. Medical radiology assistants who have on-the-job training by a registered radiology technician (RT-R) and have documented competencies completed.

Upon hire, employees are trained on the policies, procedures, and equipment. The RSO verifies the competency of each operator and is responsible for authorizing each staff member prior to operating radiology equipment. The RSO provides staff training annually, and if the office is remodeled, relocated, adds radiation equipment, or moves to a new facility. Refer to *RAD-100.05 Training Staff on Radiation Protections.*

A list of employees authorized to operate the x-ray equipment is located in the training section of the Radiation Handbook. These employees have met the certification requirements for x-ray safety training and have been trained on the policies and procedures of this practice. No one under the age of eighteen is allowed to be involved with radiation services. Exceptions are handled by the RSO, in coordination with the CDO and/or Chief Medical Officer (CMO).

## Monitoring of Radiation Exposure

CFHC, Inc. monitors radiation exposure to employees through the use of dosimeter badges. Dosimeter badges are required to be worn by all personnel who are responsible for operating the x-ray machinery. A radiation dosimeter badge does not protect the employee from radiation, but detects and measures radiation to which the employee has been exposed. The badge detects high-energy beta, gamma, or x-ray radiation. These dosimeters cannot detect low-energy beta radiation from some isotopes, including tritium (H-3) **[.1614].**

The RSO issues badges to employees and provides training on proper wearing, storage, and monitoring of radiation exposures. The control badge and employee dosimeter badges shall be stored in a site-specific, designated location. In the dental facility, the badges are stored in an appropriately labeled container in the central sterilization area. In the medical facilities, the badges are stored in an appropriately labeled container, which is kept at the radiology workstations.

The RSO collects used badges from colleagues within one week of the last wear date and is responsible for sending these to CFHC, Inc.'s contracted agency for testing. Documentation of badge disbursement and collection is documented on the *Dosimeter Badge Checklist* (see attachment). If more than one device is used, each dose is identified with the area where the device was worn on the body. Site RSO mails all badges to the vendor within 1 week of the last wear date and notes the date mailed on the checklist.

The dosing results are recorded and are available at Open Healthcare Solutions, www.myradcare.com. The RSO downloads and prints copies for their departments quarterly. Results are also kept in the Radiation Handbook(s) at each facility for one year and then scanned into the Audit drive, Radiology folder for safekeeping. The dental binder is stored in the office of the Chief Dental Officer at CFDC. The medical binder is kept at the radiology workstations at WCHC & HFHC.

The personnel exposure records shall be reviewed quarterly by the RSO, the chief of staff over the department, and the employee to ensure no excessive exposure has been received by the employee. All parties sign the *Dosimeter Badge Checklist* as proof of their review and verification of dose exposure.

**Employee Guidelines for Wearing and Storing Monitoring Badges**

- Never share your badges or wear another person's badges. Each badge is intended to be worn by only the designated person.
- Do not intentionally expose badges to radiation. Intentional tampering with badges is a very serious matter.
- No matter how curious you are, do not wear your badges when you receive a medical x-ray or other medical radiation treatment. Your badges are intended to document occupational doses, not medical doses.
- Store your badges in the designated area when not in use.
- Wear your body badge on the part of your body between your neck and waist, most likely to be exposed to the greatest amount of radiation. Wear it so that the name tag faces toward the source of radiation. When an apron is worn, the monitoring device is worn at the collar outside the apron.
- If you are issued waist and collar dosimeters, the collar dosimeter is worn outside your lead on the collar. The waist dosimeter shall be worn under the lead on your waist.
- If you lose your badge, notify the Radiation Safety Officer to obtain a replacement badge as soon as possible.

Employees may be subject to disciplinary action up to and including termination if they fail to wear dosimeter badges as required or fail to return badges to RSO at the end of each quarterly wear period.

**Exposure from Previous Employment**

CFHC, Inc. shall reduce the amount an individual may be allowed to receive in the current year by the amount of the prior year or current occupational dose received while employed by another entity **[.1604 (f)].** The RSO refers to 10A NCAC 15 **[.1638]** to make the adjustment prior to employment if this situation occurs.

CFHC, Inc. accepts,

1. as a record of the occupational dose that the individual received during the current year, a written signed statement from the individual, or from the individual's most recent employer for work involving radiation exposure, that discloses the nature and the amount of any occupational dose that the individual may have received during the current year;
2. as the record of lifetime cumulative radiation dose, an up-to-date agency form for recording occupational radiation dose history, or equivalent, signed by the individual and counter-signed by an appropriate official of the most recent employer for work involving radiation exposure, or the individual's current employer if the individual is not employed by CFHC, Inc.; or

3. reports of the individual's dose equivalent(s) by telephone, electronic media, or letter from the most recent employer for work involving radiation exposure, or the individual's current employer if the individual is not employed by CFHC, Inc. CFHC, Inc. requests written verification of the dose data if the authenticity of the transmitted report cannot be established.

CFHC, Inc. records the exposure for occupational radiation dose history. The record should show each period in which the individual received occupational radiation exposure and the dose, and it is signed by the individual who received the exposure. For any period in which CFHC, Inc. does not obtain a report, CFHC, Inc. notates this in the employee's personnel file, indicating the periods of time for which data are not available.

CFHC, Inc. is not required to reevaluate the separate external dose equivalents and internal committed dose equivalents or intakes of radionuclides assessed prior to January 1, 1994. Further, occupational exposure histories obtained and recorded before January 1, 1991, may not have included effective dose equivalent but may be used in the absence of specific information on the intake of radionuclides by the individual.

If CFHC, Inc. is unable to obtain a complete record of an individual's current and previously accumulated occupational dose, CFHC, Inc. assumes:

i. in establishing administrative controls for the current year, that the allowable dose limit for the individual is reduced by 1.25 rems (12.5 mSv) for each quarter in which records were unavailable and the individual was engaged in activities that could have resulted in occupational radiation exposure; and
ii. that the individual is not available for planned special exposures.

CFHC, Inc. retains the records for recording occupational radiation dose history or equivalent until the agency terminates each pertinent license or registration requiring this record. CFHC, Inc. retains records for recording occupational radiation dose history for three years after the record is made.

**Annual Occupational Doses**

CFHC, Inc. shall limit the occupational dose to staff to the following dose limits **[.1604 (a)]:**

- An annual limit, which is more limiting of:
  - Total effective dose equivalent of 5 rems (5,000 mrems; 0.05 Sv); or
  - The sum of the deep-dose equivalent and the committed dose equivalent to any individual organ or tissue other than the eye being equal to 50 rems (0.5 Sv)
- Eyes and skin:
  - Eye dose equivalent of 15 rems (15,000 mrems; 0.15 Sv); and
  - Shallow dose equivalent of 50 rems (50,000 mrems; 0.50 Sv) to the skin of the whole body or the skin of any extremity
- Pregnant worker – limit of 0.5 rems (500 mrems; 5 mSv) during the entire gestational period.

## Staff Dose Limits Exceeded

If the dose exceeds the annual dose limits noted above, the RSO and employee, notify the department chief of staff, the Chief Operating Officer, and the Chief Compliance Officer through the completion of an incident report. Refer to *RM-101 Incident Reporting*. The incident is assigned to the Medical/Dental CIT to conduct a root-cause analysis and implement activities or equipment repairs to mitigate further exposure.

The CFHC, Inc. must file a report of the exceedance according to Rule **[.1646],** identifying the cause of elevated exposure, and promptly take appropriate corrective action against recurrence. The report must include:

a. The person's name,
b. date of birth,
c. social security number,
d. dose received,
e. cause of elevated exposure, and
f. corrective action is taken.

This information must be documented in the incident report. A copy of the radiation exposure report is attached to the incident. Corrective action may include reassigning personnel duties.

The Chief Compliance Officer notifies the Division of Radiation Protection.

Division of Radiation Protection
Radiation Protection Section
5505 Creedmoor Road, Suite 100
1645 Mail Service Center
Raleigh, NC 27699-1645
Phone: 919-814-2250
Email: drp.x-ray@dhhs.nc.gov

There are other situations where potential exposure to staff and patients exceeds standards. In these events, notifications to the Division of Radiation Protection is required. Refer to *RAD-**100.03** Reporting of Radiation Incidents*. **[.1646 and .1647].**

## Requests for Records of Radiation Exposure

At the request of a former employee, CFHC, Inc. furnishes to the worker a report of the worker's radiation dosage. The report:

a. is furnished within 30 days from the time any request is made, or within 30 days after the information has been obtained by CFHC, Inc., whichever is later;
b. covers, within the period of time specified in the request, each calendar quarter in which the worker's activities involved exposure to radiation by radiation machines registered with the agency; and
c. includes the dates and locations of work under the license or registration.

## Declaration of Pregnancy by CFHC, Inc. Employee

It is CFHC, Inc.'s responsibility to take appropriate actions to ensure the dose to a fetus due to occupational exposure is not above standard when an employee declares pregnancy. It is the responsibility of employees responsible for operating x-ray equipment to notify CFHC, Inc. of pregnancy as soon as possible after medical confirmation. **[.1610 and .1614 (1)]** CFHC, Inc., ensures the following regarding dose limits for the employee:

a. The dose does not exceed 0.5 rem (5 mSv or 500 mrem) during the entire pregnancy.
b. The dose does not exceed more than 0.5 mSv in any month
c. The dose to the fetus is measured as the sum of:
    i. The deep-dose equivalent to the declared pregnant woman and
    ii. The dose to the embryo from radionuclides in the embryo and radionuclides in the pregnant woman.

Verbal notification of pregnancy is not an acceptable form of notification by the employee. A declaration of pregnancy must be submitted in writing using the appropriate form located on CFHC Inc.'s intranet. Refer to *RAD-100.04 Declaration of Pregnancy*.

## Pregnant Patients

### A. Medical

All female patients in their reproductive years (9 to 60 years of age) are questioned as to the possibility of pregnancy and required to review, complete, and sign the *Diagnostic Imaging - Pregnancy Acknowledgement Form* prior to any x-ray (see attachment). A copy of this form is scanned into the patient's electronic health record. This is done as sensitively and unobtrusively as possible, in keeping a woman's privacy and dignity intact.

If the patient states they are unsure of pregnancy status, a urine pregnancy test is completed. If the urine pregnancy test is negative, the radiology exam may be performed. If the urine pregnancy is positive, the radiology technician or medical radiology assistant notifies the ordering provider or his/her covering provider. The provider determines whether to proceed with the radiological examination. Refer to *SO-107 Pregnancy Testing for Patients Being Exposed to Radiation*.

If the patient is pregnant and the x-ray will be conducted, she is thoroughly informed of the risks associated with radiation to the embryo/fetus and the benefits of proceeding with x-ray, if applicable, by the ordering provider or covering provider. This discussion is documented in the encounter. The decision for x-ray is left up to the patient.

### B. Dental

Dental radiographs are considered safe for the pregnant patient at any stage during pregnancy when abdominal and thyroid shielding is used. Regardless, the patient's pregnancy status is documented in the encounter when radiographs are planned. If the patient is uncertain of her pregnancy status, the patient may opt to postpone dental treatment until confirmation is received. This is documented in the encounter, and the patient reschedules their appointment. For a confirmed pregnant patient, a medical consultation is sent to her obstetric provider in accordance

with *DTL-202P Medical Consultation for Dental Treatment* to confirm and document clearance for all dental treatment, including x-rays, throughout the pregnancy.

If the provider recommends the x-ray after weighing benefits and risks, but the patient refuses, an *Informed Refusal* form shall be completed. Refer to *RM-506.01 Consents and Informed Refusal*. If the patient decides to proceed with the x-ray examination, the patient is properly shielded, including the use of thyroid and gonadal shields, unless they interfere with the examination. Shielding shall be documented.

## Technique Charts

The technique factors to be used during an exposure are indicated before the exposure begins, except when automatic exposure controls are used, in which case, the technique factors that are set prior to the exposure are indicated.

Indication of technique factors is visible from the operator's position.

On equipment having fixed technique factors, the recommendation is satisfied by permanent markings.

## Dental Technique Charts

In the vicinity of the Panoramic/Cone Beam Computed Tomography (CBCT) diagnostic x-ray unit's pre-programmed control panel, technique charts are provided, which specify for all usual examinations and associated projections which are performed by that system, a listing of information including patient's anatomical size versus technique factors to be utilized at a given source to image receptor distance.

The Nomad Pro Handheld System contains a pre-programmed control panel and available technique charts to ensure that the appropriate techniques are utilized as detailed above.

## Medical Technique Charts

Technique charts for medical x-rays are located visibly near the control console. Staff trained in radiology must adhere to the use of the recommended techniques.

## Requirement for Person to be in the Room During Radiation Exposures

Other than the patient being examined, only the professional staff and ancillary personnel required for the procedure or training are allowed in the room during the radiographic exposure.

CFHC, Inc. staff follow the following best practices as they relate to individuals in the room during radiation exposures:

1. It is best if no one is in the x-ray room during exposure except the person being examined.
2. Patients are positioned such that no part of the body, including the extremities that are not protected by a 0.5 mm lead equivalent, will be

exposed to the useful beam.

3. Professional staff and ancillary personnel are protected from direct scatter radiation by protective aprons or whole-body protective barriers of not less than
   0.25 mm lead equivalent.
4. When circumstances arise that require someone else to remain in the room, it is preferable to select a male family member. If a female is utilized, the staff ensures pregnancy is not a factor. Proper shielding must be used for this individual (i.e., they are protected from the direct scatter radiation by protective barriers of 0.25 mm lead equivalent or are so positioned that the nearest portion of the body is at least six feet from both the tube head and the nearest edge of the image receptor).
5. When a portion of the body of non-occupationally exposed professional staff or ancillary personnel is potentially subjected to stray radiation, which would result in that individual receiving one-fourth of the maximum permissible dose, additional protective measures are employed.

## Gonad and/or Lead Shielding

Lead shielding is always used during exams unless it interferes with the anatomy being examined. Staff use extra precautions when shielding someone who is pregnant.

Staff use appropriate shielding when performing exams when there is a risk of occupational exposure.

Gonadal or thyroid shields are always used unless they obstruct the image. Gonad shielding of not less than 0.5 mm lead equivalent is used for potentially procreative patients during radiographic procedures in which the gonads are in the direct, or useful beam, except for cases in which this would interfere with the diagnostic procedures. Dental patients receiving an x-ray examination are covered by a lead apron and a thyroid collar. Medical patients are shielded as appropriate for the x-ray being taken.

Inspections of the shielding devices are conducted annually or whenever there is a concern about the integrity of the shield. Refer to *RAD-100.06 Lead Shields Inspections*.

## Ordering of Radiology Examinations and Re-Takes

Licensed independent practitioners (LIPs) who possess the appropriate licensure and privileges are allowed to order x-ray examinations and “retakes.” All radiology orders are recorded in the electronic health record system for scheduling, billing, and tracking purposes. Staff do not perform x-rays on individuals without a signed order from a provider. This Plan and State regulations specifically prohibit deliberate exposure of an individual for training, demonstration, or other non-healing arts purposes.

## Additional Measures to Minimize Exposure – Dental

### Intraoral Dental Radiographic Systems

1. X-ray systems designed for use with an intraoral image receptor are provided with means to limit source-skin distance to not less than:
   a. 18 centimeters, if operated above 50 kilovolts peak; or

b. 10 centimeters, if operated at or below 50 kilovolts peak.

2. The size of the direct radiation beam is limited in accordance with the following:
    a. Radiographic systems designed for use with an intraoral image receptor are provided with means to limit the x-ray beam such that:
        i. If the source-skin distance (SSD) is 18 centimeters or more, the x-ray field at the SSD is containable in a circle having a diameter of no more than seven centimeters; and
        ii. If the SSD is less than 18 centimeters, the x-ray field at the SSD shall be containable in a circle having a diameter of no more than six centimeters.
3. The timing device complies with the following requirements:
    a. Termination of the exposure after a preset interval;
    b. Termination of exposure causes automatic resetting of the timer to its initial setting or to zero;
    c. It is not possible to make an exposure when the timer is set to a zero or "off" position if either position is provided; and
    d. When four timer tests are performed at identical timer settings equal to five seconds or less, the average time period (T) must be greater than five times the difference between the maximum period (Tmax) and the minimum period (Tmin) in accordance with the formula: $T > 5(Tmax- Tmin)$
    e. Intraoral dental radiographic systems are equipped with an electronic timer. Timer accuracy is defined as the deviation of measured values from indicated values. For accurate timers, the measure does not exceed the limits specified for that system by its manufacturer.
4. The exposure switch complies with the following requirements:
    a. A control is incorporated into each x-ray system such that an exposure can be terminated at any time, except for exposures of one-half second or less.
    b. For stationary x-ray systems, the exposure switch is permanently mounted in a protected area so that the operator is required to remain in that protected area during the entire exposure.
    c. The x-ray control provides a visual indicator observable at or from the operator's protected position whenever x-rays are produced. In addition, an audible signal indicates that the exposure has terminated. If the audible signal is not working, turn off the x-ray system and report to the RSO.
5. The exposure produced must be reproducible such that when all technique factors are held constant, the coefficient of variation does not exceed 0.10. This is deemed to be met if, when four exposures at identical technique factors are made, the value of the average exposure (E) is greater than five times the difference between the maximum exposure (Emax) and the minimum exposure (Emin) in accordance with the formula: $E > 5(Emax- Emin)$
6. Patient and film-holding devices are used when the techniques permit.
7. The position indicates the device is not hand-held during an exposure.
8. Dental fluoroscopy without image intensification is not used.

**Mobile /Portable Radiographic Examinations**

1. In compliance with the general requirements:
    a. Persons employed at CFDC who are expected to expose radiographic images are required to complete operator training of the Nomad Pro Handheld X-ray System for Intraoral Radiographic Imaging and show proficiency in its operation, including:
        i. Location and use of exposure controls
        ii. Location of storage and charger
        iii. Disinfectant procedures
2. While operating the Nomad Pro Handheld X-Ray System for Intraoral Imaging, the operator ensures the following:
    a. No one is allowed in the room with the patient during an x-ray examination or closer than six feet, whichever is applicable.
        i. Unnecessary individuals are removed from the room or radiation area prior to exposures whenever possible.
        ii. Individuals who cannot be removed from the room during X-ray exposures are positioned behind a protective barrier.
    b. If other persons are needed to assist with the examination, they wear appropriate lead aprons and follow safe radiation procedures and keep out of the direct path of the beam.
        i. The device is properly and optimally aimed as recommended for each exposure during training. Visual and aural contact with the patient is maintained during the procedure.
        ii. Image holders (XCP) are used for all examinations to prevent patients from holding image receptors with their hands.
        iii. If use requires angling the unit to a position that reduces the protection to the operator, then the operator is protected from direct scatter radiation by protective lead aprons or whole body protective barriers of not less than
        0.25 mm lead equivalent.
        iv. Exposure guides are followed. Technique guides are maintained and updated as needed. Their proper use should result in diagnostic images.
        v. The patient is never allowed to hold the Nomad Pro Handheld X-ray System during the exposure.
        vi. When the Nomad Pro Handheld System is used in an open area, a clearly audible announcement is made stating that the Nomad Handheld X-ray System is being used. A controlled perimeter is established and monitored by the operator.
        vii. Operators wear a radiation monitoring device during hand-held dental x- ray exposures.
        viii. Entrances to exam rooms have radiation area warning signs posted, as required.
        ix. Digital sensors (Phosphor Storage Plates) are used for radiographic exams to ensure the fastest exposure speed.
    c. The Nomad Pro Handheld unit and accessories are stored in a locked

supply closet when not in use within the restricted area of the facility.
d. Dosimetry badges are mandatory for all Nomad operators.
e. Dosimetry monitoring services are provided by Landauer.

**Visual Contact of Patient and Operator Location During Exposure**

1. Panoramic images
    a. A window of lead-equivalent glass equal to that required by the adjacent barrier is in place so that the operator can see the patient without leaving the protected area during panoramic exposures.
2. Intraoral Images
    a. While obtaining intraoral images, the operator utilizes the Nomad Pro Handheld System and, thus, maintains visual contact with the patient throughout the radiographic examination

**Visual Indicators and Audible Signals**

1. The Nomad Pro Handheld System has an audible beep and a visible flash to indicate an exposure.
2. The digital panoramic unit has an audible beep throughout the exposure, which is automatically terminated at the end of the exposure. The panoramic computer monitor also displays a visible message that states that an exposure is taking place.
3. If the visual and/or audible signals are not working, turn off the x-ray system and report to the RSO.

**Quality Control and Assurances**

CFHC, Inc. operates quality and risk management activities through its Central-Compliance Committee and subcommittee called Continuous Improvement Teams (CITs). Refer to *RM-100 Compliance Program.* The Radiology Manager will sit on the Medical CIT and report to the team:

- Incidents involving the radiology program or staff, including but not limited to dose monitoring reports that exceed standard;
- Destruction, alterations, or maintenance of the radiology equipment; and
- Any other risk management or quality reports.

## VI. ATTACHMENTS

- North Carolina Regulations for Protection Against Radiation 10A NCAC 15 (NCRFPAR)
- *Dosimeter Badge Checklist form*
- Notice to Employees
- *Notice to Employees Acknowledgement form*
- *Diagnostic Imaging - Pregnancy Acknowledgement Form*