

Radiology Compliance Branch

RADIATION PROTECTION SECTION



Division of Health Service Regulation • N.C. Department of Health and Human Services

Dental Radiation Safety Guidance

Rule .0104 DEFINITIONS

(10) "ALARA" (acronym for "As Low As Reasonably Achievable")

Making every reasonable effort to maintain exposures to radiation as far below the dose limits as is practical consistent with the purpose for which the licensed or registered activity is undertaken, taking into account the state of technology, the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to utilization of sources of radiation in the public interest

When working around radiation a general principle to follow is the ALARA concept. It encourages all to keep radiation exposures: As Low As Reasonably Achievable (ALARA) The general rules to follow are to decrease time, increase distance, and increase shielding from sources of radiation. Consider the current procedures and activities carried out at the facility and if needed, make necessary changes to ensure incorporation of the ALARA concept into daily procedures and activities.

New guidelines from the American Dental Association (ADA) and Food and Drug Administration (FDA) recommend that dental radiographs be taken after patient assessment and **not** on preset guidelines. Increasing film speed can decrease patient dose up to 50 percent. The American National Standards Institute in conjunction with the International Organization for Standardization state film speed below E speed should not be used in dental radiography. It is preferred that E or F speed be used. Panoramic film speed of at least 400 used with rare earth intensifying screens will also aid in reducing patient dose.

Position Indicating Device (PID):

Rule .0602 DEFINITIONS

(40) "Position Indicating Device (PID)" means a device on dental equipment used to indicate the beam position and to establish a definite source-skin distance. It may or may not incorporate or serve as a beam-limiting device.

A metallic lining within the PID will reduce exposure to the patient. In addition, increasing the source-to-skin distance from 20 cm to 40 cm will decrease dose 10 to 25 percent.

Patient Shielding:

Rule .0603(a)(1)(I)

Procedures and auxiliary equipment designed to minimize patient and personnel exposure commensurate with the needed diagnostic information shall be utilized. The use of rectangular vs. circular; rectangular type collimation will reduce dose up to 5 percent more.

The use of patient shielding will decrease dose from any scatter radiation. The integrity of lead shielding should be maintained with proper care and storage. Inspection of the shielding should be done with supporting documentation. If any patient is held, the use of holding devices or film



holders should be employed. If a member of the family/caregiver must assist whole body shielding of at least 0.25 mm lead equivalent must be used. No one person should hold patients on a routine basis.

Operator Protection: [.1603(b)] [.1604(a)(1)]

Incorporation of the ALARA concept is essential. Occupational protection should include employing the use of protective barriers, personal monitoring, education on the effects of ionization radiation and proper implementation of safety procedures. Additional information from The National-Council on Radiation Protection is the best reference to appropriate shielding requirements and design.

Processing and Infection Control: Information on the NCRP Website may provide facilities with a reference guide for infection control and disposal information for darkroom waste

<https://radiation.ncdhhs.gov/>. Darkrooms play a very important part in reducing unnecessary exposure to the patient; a properly developed film reduces the need to repeat images. Repeating images due to overexposure and underdeveloped film increase the dose to the patient and the operator, while providing less than diagnostic quality images. Proper chemical mixture and temperature is as important to film development as the technique used to expose it. Dental facilities may benefit more from a darkroom rather than the use of a daylight processor when it comes to infection control. However, proper ventilation, use of chemical processors, and the effect of safelight exposure to the film now become concerns for the facility.

Quality Assurance:

Dental facilities should have a well-maintained quality assurance program. Operators should have a good working knowledge of these protocols and know where to find additional information. Quality Assurance programs are a valuable tool for management, staff, and patients. Incorporated correctly, results are fewer repeats; staff time is utilized wisely and is cost effective. Documentation of equipment assessment, inspection results of lead aprons and cassettes, history of equipment maintenance and repairs are vital to ensure good patient care. Protocols current with the facility needs and detailed documentation will aide in reducing both operator and patient dose. Equipment surveys are recommended at least every 4 years or when any modification to the equipment is made.

Digital Radiography: Advantages and Disadvantages

Digital radiography can save down time waiting for the image to process, eliminate the need for a darkroom thus providing more office space, and there is no need for room to store films. The images are stored in electronic medical records, downloaded on to a CD, or printed to film or paper. Most important, if used correctly, digital imaging may lower patient dose. Image receptors that use photostimulable storage phosphor (PSP) plates are reusable; however, the downfall to this is each must be cleaned thoroughly for infection control. A facility would require multi PSP plates and each would need to be exposed to a high intensity light for one minute to clear all prior images before reusing. Direct Digital systems use the Charged-coupled device (CCD), attached to a cable links directly to a digital convert for instant viewing. The surface areas exposed to scatter often smaller than the actual size presented causing the need for possible repeated images and increasing patient dose. The size of receptor is larger than film and can inhibit patient positioning, reducing image quality. Another disadvantage of direct digital plates is new standards for infection control. They cannot be autoclaved, due to the heat intolerance. A variety of systems can be used for processing the direct image. One concern of the American Dental Association (ADA) is the need for images to be available through the Digital Imaging and Communications in Medicine (DICOM) system. As the need for radiographic images to be shared among the dental profession grows, so do the different

types of programs to link these systems. The Standards Committee on Dental Informatics (SCDI) has set standards for these programs to ensure they are in compliance with "SDA SCDI TR 1023".

Training and Education:

Rule .0603(a)(1)(B)

Individuals who will be operating the equipment shall be instructed in safe operating procedures and use of equipment, and demonstrate an understanding thereof to the registrant.

Operators of X-ray equipment should have proper training and be knowledgeable in patient safety. Education in universal precautions and infection control is vital for dental staff due to the occupational exposure they receive. Training and education should be ongoing and comprehensive. While digital images provide the ability to measure, invert, magnify and enhance the image, there is no substitute for using the appropriate technique for the patient type and exam requested. Well-written procedures and having staff knowledgeable in radiation safety protocols will ensure an optimal image while keeping patient exposure to a minimum. Continuing education is another important principle for a dental facility to consider. The field of radiography is fast changing with new devices, techniques and equipment to lower the exposure levels and improve image quality. Routinely visiting the ADA's website and <https://radiation.ncdohhs.gov/> will provide guidance in developing a facility- specific radiation safety program.

