Did you know?

The Last Parts of Chapter 41 of the Iowa Administrative Code.

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And now let us look at requirements for intraoral dental radiographic systems.

> **41.1(7)** *Intraoral dental radiographic systems.* In addition to the provisions of 41.1(3) and 41.1(4), the requirements of 41.1(7) apply to X-ray equipment and associated facilities used for dental radiography. Requirements for extraoral dental radiographic systems are covered in 41.1(6). Only systems meeting the requirements of 41.1(7) shall be used.
> *a. Source-to-skin distance.* X-ray systems designed for use with an intraoral image receptor shall be provided with means to limit source-to-skin distance to not less than:
> (1) 18 centimeters if operable above 50 kVp, or
> (2) 10 centimeters if not operable above 50 kVp.

What is referred to here is the position indicating device (PID), the round or rectangular tube (still referred to by some as the cone, although true cones are not legal in Iowa anymore). This device aids in establishing the appropriate distances for either bisecting-the-angle or paralleling intraoral technique. It also prevents the source of radiation from being placed closer to the patient's skin. Inasmuch as most dental x-ray units are operated at 65 kVp or greater, the 18 centimeter rule would apply here.

> *b. Beam limitation.* Radiographic systems designed for use with an intraoral image receptor shall be provided with means to limit the X-ray beam such that:
> (1) If the minimum source-to-skin distance (SSD) is 18 centimeters or more, the X-ray field, at the minimum SSD, shall be containable in a circle having a diameter of no more than 7 centimeters; and
> (2) If the minimum SSD is less than 18 centimeters, the X-ray field, at the minimum SSD, shall be containable in a circle having a diameter of no more than 6 centimeters.
> (3) The position indicating device shall be shielded and open-ended. The shielding shall be equivalent to the requirements of 41.1(4)*"c."*

Modern intraoral dental x-ray units are made to comply with the beam limitation requirements, which are nationwide. The restriction off the beam (collimation) may be achieved through a piece of lead that is inserted in the path of the beam. This lead has an aperture that only allows the central part of the x-ray beam to leave the unit, and insures that when the Tubehead is placed at the proper distance from the patient's skin (see section **41.1(7) a**. above) the beam diameter does not exceed the limit required by this section of the IAC. This lead collimator, which looks like a large lead washer, may be a separate entity, or may be incorporated into the PID. When different length PIDs are used, different size apertures are required to ensure that the beam is properly restricted. If the collimator is incorporated into the PID, changing PIDs for different techniques will automatically ensure that correct beam diameter at the skin. Thus, one may not use the 18 cm PID, which is designed for the 8 inch source to receptor distance used with the bisecting-the-angle technique, and merely back away from the patient by an extra 8

inches to use the paralleling technique, as this would double the diameter of the beam at the skin. If the collimator is separate, changing PID lengths requires changing the collimator as well.

Some PIDs have a smaller stainless steel inner tube. These are the collimator.

The third requirement above in effect means that plastic cones, which used to be the norm on older intraoral dental x-ray units may not be used. The reason is that with these the x-ray beam had to pass through the cone. When it did so, it interacted with the plastic of the cone and produces a wide field of scatter radiation that exposed a larger area of the patient.

Also, of course, the operator may not remove or enlarge the collimator, as this would expose a larger area of the patient.

Rectangular shielded PIDs restrict the size of the beam even more, and are preferable to round collimators.

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> *c. Exposure control.*
> (1) Exposure initiation.
> 1. Means shall be provided to initiate the radiation exposure by a deliberate action on the part of the operator, such as the depression of a switch. Radiation exposure shall not be initiated without such an action; and
> 2. It shall not be possible to make an exposure when the timer is set to a "zero" or "off" position if either position is provided.

This requires no further explanation.

> (2) Exposure indication. Means shall be provided for visual indication observable at or from the operator's protected position whenever X-rays are produced. In addition, a signal audible to the operator shall indicate that the exposure has terminated except in X-ray systems that cannot be altered to meet this requirement.

Again, this requires no further explanation.

> (3) Exposure termination.
> 1. Means shall be provided to terminate the exposure at a preset time interval, preset product of current and time, a preset number of pulses, or a preset radiation exposure to the image receptor. In addition:
> 2. Termination of exposure shall cause automatic resetting of the timer to its initial setting or to "zero."
> 3. An X-ray control shall be incorporated into each X-ray system such that an exposure can be terminated by the operator at any time, except for exposures of one-half (½) second or less.

These too are self-explanatory. Pulses (or impulses as they are often called) are subdivisions of a second. They correspond to the 60 cycle (or hertz) per second alternating current that we use in the USA. Each complete alternation in current occurs 60 times a second, and each of these is called a pulse or impulse. Each pulse or impulse is equal to 1/60 second. Modern timers are usually labeled in multiples of seconds at and above 1 second, and numbers of impulses below 1 second.

> (4) Exposure duration (timer) linearity. For systems having independent selection of exposure

time settings, the average ratios (X_1) of exposure to the indicated timer setting, in units of C $kg^{-2}s^{-1}$ (mR/s), obtained at any two clinically used timer settings shall not differ by more than 0.10 times their sum. This is written as:
$(X_1 - X_2)$ _ $0.1 (X_1 + X_2)$
where X_1 and X_2 are the average values.

This would be something for your radiation physicist or approved service provider to check.

(5) Each X-ray exposure switch shall be located in such a way as to meet the following requirements:
1. Stationary X-ray systems shall be required to have the X-ray exposure switch located in a protected area or have an exposure switch cord of sufficient length to permit the operator to activate the unit while in a protected area, e.g., corridor outside the operatory. The procedures required under 41.1(3)*"a"*(4) must instruct the operator to remain in the protected area during the entire exposure.

The main thing here is that not only must there be a protected area, but that the operator must be instructed to stay in this area. This would be good to have in the office procedures manual.

2. Mobile and portable X-ray systems which are:
_ Used for greater than one week in the same location, i.e., a room or suite, shall meet the requirements of 41.1(7)*"c"*(5)"1."
_ Used for greater than one hour and less than one week at the same location, i.e., a room or suite, shall meet the requirements of the above paragraph or be provided with a 6.5 foot (1.98 m) high protective barrier or means to allow the operator to be at least 9 feet (2.7 meters) from the tube housing assembly while making exposure.

The important thing here is that having a mobile or portable unit does not exempt the operator from meeting radiation protection requirements. The distance requirement should be particularly noted. Iowa is, to the best of my knowledge, the only jurisdiction that requires the operator to be 9 feet from the tube housing is there is no barrier. Other jurisdictions requires either 6 feet or 2 meters.

The next for sections are technical and once again are for your radiation physicist or approved service provider to check.

h. Administrative controls.
(1) Patient and film holding devices shall be used when the techniques permit.
(2) The tube housing and the PID shall not be hand-held during an exposure.
(3) The X-ray system shall be operated in such a manner that the useful beam at the patient's skin does not exceed the requirements of 41.1(7)*"b"*(1).
(4) Dental fluoroscopy without image intensification shall not be used.

These too are self-explanatory.

The remaining sections deal with computed tomography, radionuclide use, radiotherapy, and other forms of diagnostic or therapeutic uses of radiation that do not impact on most dental offices.

And that concludes our little stroll through the IAC.