[SAMPLE FORM]

**ANNUAL RADIATION REVIEW FOR RADIATION WORKERS**

As part of the ALARA Policy of the facility, all personnel shall review the radiation safety practices annually. This in-service should be documented.

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Radiation Safety Program

General
1) General Radiation Safety Procedures are posted or filed in a place available to all users.
2) A “Notice to Employees” is posted in the darkroom, lounge, or in an area available to all employees concerned about the use of radiation at this facility.
3) The film processor should be maintained at a minimum of every four weeks.
4) Thyroid and Gonadal shielding will be used for all patients less than 45 years old.
5) High speed “D” or “E” film will be used.

Operators
1) All users of this machine are certified as adequate operators as deemed by the Colorado Dental Society.
2) The patient to be examined by x-ray is the only person allowed in the room during exposure.

Maximum Exposure Rates
4.6.1.1 An annual limit, which is the more limiting of:
   (1) The total effective dose equivalent being equal to 0.05 Sv (5 Rem) (5000 mR)

Film Badge Monitoring
Based on the workload and calculated maximum exposure rate for operators, exposure levels described in Part IV of the State of Colorado regulations will not be exceeded for the general public. Exposure values for occupationally exposed employees will not exceed 10% of the annual DDE dose limit. However, it is recommended that film badge monitoring be used to verify these calculations. After 6 months of acceptable readings, this service can be discontinued, if desired. Records of such monitoring shall be kept at the facility.
Dental Facilities Radiation Protection Procedures
As Low As Reasonably Achievable (ALARA)

1) Always think about the radiation safety aspects of any x-ray examination, providing radiation protection to the patient, other office personnel, the public and yourself.

2) Practice sound radiation protection principles to achieve occupational doses and public doses As Low As Reasonably Achievable (ALARA). Think ALARA. What procedure could be preformed more efficiently and effectively, resulting in less radiation exposure?

3) Written safety procedures need to include machine operating procedures and a policy on selecting a holder.

   A) Machine operating procedure:

   No employee may operate any x-ray machine unless adequately instructed in basic radiation safety practices and the safe operation of x-ray producing equipment. The operating procedure form must be signed and dated by each employee. Training must be provided prior to operation of an x-ray machine.

   B) Policy on selecting a holder and procedure to follow:

   a. Never hold a patient, or film during an exposure, except in an actual emergency situation. Mechanical holding devices shall be used when the technique permits. If such emergency work is common, no single individual shall be regularly used for this practice.

   b. Never hold the x-ray tube housing or the collimator cone during an exposure. X-ray tubehead support assemblies are required by the regulations to be stable enough to remain positioned unattended.

4) Use a lead apron on patients during x-ray procedures.

5) No x-ray machine will be operated with the aluminum filtration removed.

6) Never direct the primary radiation beam toward another patient or employee. To prevent such a primary beam exposure, reposition the patient’s chair and x-ray source, or use available shielding.

7) The useful radiation beam must always be entirely intercepted either by the patient, an image receptor (for extra-oral), or by the structural shielding. Only the patient shall be in the useful beam.
RADIATION PROTECTION PRINCIPLES
FOR DENTAL INSTALLATIONS

Operation protection:

Operators of x-ray equipment should be cognizant of the sources of radiation exposure and the ways to reduce the exposure. The two principal sources of radiation exposure are from primary and scattered rays.

The largest amount of radiation is received in the primary beam. Exposure in the primary beam is roughly one thousand times that outside the beam due to scatter, one meter from the center of the beam. For this reason, even brief exposures to the primary beam should be avoided.

Radiology personnel should never hold patients during radiographic examinations. The Rules and Regulation Pertaining to Radiation Control of the State of Colorado section 5.5.3.1 state that:

“No individual occupationally exposed to radiation shall be permitted to hold patients during exposures except during emergencies, nor shall any individual be regularly used for this service.”

Scattered radiation is the other principal source of radiation exposure in a radiographic room. In Dentistry, the best method of protection is to use distance between you and the patient. Always stand at least 6 feet from the patient being X-rayed.

Patient Protection:

Items to consider when performing a radiographic examination that will reduce the amount of radiation the patient is exposed to include:

1. Always position carefully, to ensure irradiating the film the first time, and reduce the retake rate.
2. Maintain an up to date technique chart and use it so the correct technique is used the first time.
3. With variable kVp machines, use as high a kVp as is possible to get the information needed for the diagnosis.
4. Instruct the patient carefully with regard to holding their breath for the exposure and if necessary use restraints so that repeats due to emotion are minimized.
5. Use Gonadal shielding for all patients of reproductive age.
6. Never remove filters without consulting the physicist.
7. If Film is Used: Monitor the processing conditions to make sure that the chemicals are always fresh, the temperatures are correct, and that the processor is clean and functioning smoothly. Repeated films represent double the exposure to the patient and double the cost: utilize the correct procedure in the darkroom to eliminate this problem. Mix chemicals according to manufacturer directions. If dip tanks are used, use a timer and a thermometer per package directions. Test your safelight once a year. Your qualified inspector or chemical supplier can assist you in development of a safelight test protocol.

8. Always stand at least six (6) feet from the patient, or behind a protective barrier when initiating an x-ray exposure. Never stand in direct line with the beam, regardless of distance from the tube.

9. No x-ray exposure will be made without proper radiation beam limitation. For intra-oral x-ray machines, no exposure will be made with the beam limiting cones removed. For extra-oral (or panoramic and cephalometric) equipment, no exposure will be made unless the primary radiation beam is collimated to an area no larger than the image receptor. Ideally, collimation should be only to the clinical region of interest.

10. Review the Radiation Protection program on an annual basis.

“As low as reasonably achievable” (ALARA) means making every reasonable effort to maintain exposures to radiation as far below the dose limits in the regulations 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 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 nuclear energy and licensed or registered sources of radiation in the public interest.
DENTAL X-RAY SAFETY PROCEDURES

1) All x-rays should be taken by personnel with adequate training about the hazards of radiation and the proper utilization of the x-ray machine.
2) Provide all patients <45 years old with a lead apron prior to the x-ray exposure.
3) Verify that the cone is stable prior to exposure.
4) The operator should stand as far away as possible from the x-ray tube. The minimum distance without a barrier is 6 feet.
5) Verify the x-ray beam is limited to the patient.
6) Prior to exposure, verify that the room is clear of other personnel or patients.
7) Film processing chemicals should be changed at a minimum of 4 weeks. More frequent changes are necessary for high workloads or when the development time increases.
8) In the case where variable collimator sizes are available, use the smallest collimator size available that still provides the image desired.
9) Do not remove the cone or collimation for an exposure.
10) The patient or operator is not allowed to hold the cone during the exposure.
11) Use the smallest exposure time and mA setting that still provides an adequate image density and contrast.
12) Cephalometric tubes require accurate alignment. Verify that the center of the beam is perpendicular to the film cassette or sensor. If a light field is available, turn off the room lights if possible to enhance the light field.
13) Post technique charts and update with changes (film change, move to digital or x-ray machine modifications).
14) If film badges are utilized, keep the “control” badge away from the control panel or x-ray room. Do not share badges with other personnel.
PANOREX/CEPH X-RAY SAFETY PROCEDURES (Digital)

1) Use lead aprons for all patients <45 years old.

2) Verify that the patient is selected in the imaging software.

3) When applicable, verify that the line voltage is in the proper operating range for the machine.

4) Select the kVp, mA, and time settings appropriate for the patient. As the kVp is increased, absorbed dose decreases. However, contrast is reduced.

5) Verify that the patient is positioned properly and in a stable position with a bite block or head support prior to exposure. Use light or laser positioning guides if available.

6) Move the distance of the exposure cord length away or stand behind a wall.

7) Visualization of the patient during exposure is required.
PANOREX X-RAY SAFETY PROCEDURES (Film)

1) Use lead aprons for all patients <45 years old.
2) Verify that a loaded cassette is in place prior to exposure.
3) When applicable, verify that the line voltage is in the proper operating range for the machine.
4) Select the kVp, mA, and time settings appropriate for the patient. As the kVp is increased, absorbed dose decreases. However, contrast is reduced.
5) Verify that the patient is positioned properly and in a stable position with a bite block or head support prior to exposure. Use light or laser positioning guides if available.
6) Move the distance of the exposure cord length away or stand behind a wall.
7) Visualization of the patient during exposure is required.
8) Screens should be cleaned annually or more frequently for busy workloads.
9) The processor chemistry should be changed every 4 weeks or more frequently for busy workloads.
10) Maintain a clean and dry area to handle films.
11) Safelights should be checked annually for leaks in the filter. Bulb wattage should be checked.
12) Verify that the film processor developer temperature is correct (manufacturer’s recommendation) prior to use.
13) Store unused film away from areas in close proximity to the x-ray source.