

X-Ray Machine Safety for the Medical Industry FactSheet

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Operating and safety procedures for x-ray machines in Texas are outlined in the Texas Department of State Health Services (DSHS) Radiation Control Act of 1961. The procedures are generalized according to the Act. As an employer, you must develop and implement procedures to monitor employee radiation exposure that are specific for your facility. The potential health effects of radiation exposure include erythema, dermatitis, skin cancer, and bone marrow suppression.

Training

Employees who operate x-ray machines should be trained in the safe operation of the x-ray equipment, selection of proper technique from a technique chart, patient radiation protection, and proper film processing. Employers should keep a record of all training that operators receive, including the date and contents. Training should include the following:

- use of protective devices, including lead aprons, thyroid shields, lead screens, and structural shielding;
- operating and emergency procedures for the machines;
- procedures to minimize exposure; and
- use of personnel dosimeters.

Safe Work Practices

When working around x-ray machines, employers and employees should practice safety.

- Develop, implement, and enforce radiation safety procedures.
- Provide and use the appropriate personal protective equipment (PPE) [i.e. lead gloves and aprons].
- Test all lead aprons and gloves on receipt and at 12-18 month intervals for shielding integrity. If there is any doubt about an apron, it should be removed from use.
- Document personal monitoring of radiation exposure by keeping individual records of occupational radiation doses.
- Work quickly and efficiently to reduce the time using an x-ray system.
- Post a technique chart at the control panel or exposure switch to specify parameters for routine exams.
- Use the fastest film speed and the shortest exposure time for each exam to result in the lowest possible radiation exposure.
- Ensure the correct technique is set to avoid repeat x-rays.

- Use immobilizing devices to restrain patients during x-ray procedures; not radiographers or technicians.
- Remain at least 6 feet (2 meters) away from an x-ray radiation source. Radiation is significantly reduced by distance.
- Do not be near x-ray equipment, if not required, move away.
- Never stand in the line with the direct x-ray beam.
- Do not hold the tube housing during exposure, there is danger of electric shock.
- Notify a supervisor and limit occupational exposure if a employee becomes pregnant.
- Ensure x-ray machines emit an audible signal when the exposure has ended and the timer automatically re-sets to the initial setting or zero.
- Maintain records of maintenance, repairs, and modifications performed on each x-ray machine including the name of the person who performed the service and the date performed.

Monitoring Badges

Radiographers, technicians, nurses and radiologists must wear a dosimeter (radiation-monitoring badges) at all times while working with x-rays machines to detect and measure radiation.

- Wear monitoring badges at neck level or on the upper torso.
- When wearing a protective (lead) apron the dosimeter needs to be worn at the collar outside the apron.
- Ensure the additional individual monitoring devices used for monitoring the fetus (unborn child) of a pregnant employee are worn at their waist and under any protective apron.
- Each employee should review and acknowledge receipt of the monitor report for their dosimeter.
- Retain records of employee exposure, even after the employee has left the job.
- Upon leaving a job, each employee must receive a copy of their final monitoring report showing their exposure for the entire employment period.
- Store dosimeter in a safe place that is away from any sources of radiation when the badge is not in use.
- Never wear another person's monitoring badge. It is illegal.
- Report lost or damaged dosimeters immediately.

- Do not leave dosimeters in areas of high temperature such as the dashboard of a car or the clothes dryer.
- Don't tamper with the dosimeter or anyone else's dosimeter. The reports are legal documents and are regarded as real exposures received.
- If an employee works in more than one facility and wears a dosimeter in each facility, the employee is responsible for reporting his or her exposure from each job to each employer.

Film Processing Procedures

- Never assume that the film-processing unit was left in a safe working condition, check the shielding before turning the unit on.
- Properly identify and label all sources of radiation.
- Install suitable enclosures, shielding, and barriers.
- Set up barriers to prevent public access to the radiation work area.
- Place a barrier between the "Radiation Area" and the "Restricted Area."
- Limit access to equipment and sources producing radiation to trained personnel.
- When being installed, ensure that fixed shielding protects each tube.
- Ensure a clearly visible fail-safe warning light is operating on all x-ray producing equipment.
- Safety interlocks and fail-safe switches should be installed on radiation producing equipment and source containers.
- Unless a pre-operational check was made, don't trust the warning lights when they are not lit. Set the unit to its lowest setting and check the warning lights and interlocks.
- Test safety devices at least once every six months and keep records of testing.

Working with X-ray Chemicals

- Avoid contact with chemicals whenever possible.
- Handle chemical solutions carefully to avoid splashing.
- Train all employees in the safe handling of processing chemicals.
- Make available to all employees Material Safety Data Sheets for all chemicals.
- Rinse gloves thoroughly with water before taking them off.
- Check gloves regularly for pinholes, leaks, or tears.
- Dispose of gloves when they are damaged or begin to degrade.

- In case of contact with chemicals, wash hands or other affected skin areas immediately.
- After contact with an alkaline solution, such as developer, wash skin with a pH-balanced cleanser.
- If processing chemicals are splashed or spilled on clothes, immediately rinse the clothes to remove the chemical residue.
- Wash contaminated clothing before wearing again.
- Clean up chemical spills or splashes immediately.
- Always use covers on processing equipment and chemical storage tanks, because they are effective in minimizing the amount of gases, vapors, and mists that may enter the work area.
- Ensure covers are made from durable, non-reactive materials, cover as much of the open surface as possible.
- Install a lightproof vent in the darkroom or wall; these vents deliver fresh air from the adjoining hallway without bringing light into the darkroom.
- Install a local exhaust. There should be a minimum of 12 – 15 air exchanges per hour in the darkroom. A good local exhaust should be combined with general ventilation around the processor.
- Keep darkrooms at a temperature of 68-70 degrees Fahrenheit (20 – 22.5 degrees Celsius). Higher temperatures raise the concentration of chemical vapors.
- Clean darkroom walls and floors regularly.

Personal Protective Equipment (PPE)

Check personal protective equipment (PPE) regularly to make sure it is in good working condition and fits properly. In general, the PPE required for handling processing chemicals used to develop x-rays includes:

- neoprene or nitrile gloves;
- safety goggles; and
- vinyl rubber apron or laboratory coat.

Keep all PPE (gloves, goggles, apron, etc.) free of chemical residues.

For specific information regarding x-ray machines and radiation contact the Texas Department of State Health Services, Division for Regulatory Services, Radiation Control at 512-834-6688 or visit their website at: www.tdh.state.tx.us/radiation.

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The Texas Department of Insurance,
Division of Workers' Compensation (TDI/DWC)
E-mail resourcecenter@tdi.state.tx.us
or call 1-800-687-7080 for more information.

Safety Violations Hotline
1-800-452-9595
safetyhotline@tdi.state.tx.us