



## Foundations of an X-Ray Safety Program (Industrial Use)

Webinar

May 24, 2017

Good Science in Plain Language®

## Webinar Functionality

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- Audience is in silent mode by default
  - Only the presenter's audio will be transmitted
- Webcam will be off during actual presentation
- Audio: use computer or telephone (call in)
  - Computer seems to give the best sound quality
- Use the "Chat" feature to enter comments
- Use the "Questions" feature to ask questions
  - Will be answered at the end of the webinar
- A copy of the slides is available as a handout

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## Webinar Purpose

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- To discuss the foundational elements to be included in an x-ray safety program, for x-rays used in an industrial setting
  - Not intended for x-rays used in health care or veterinary medicine (separate topics)

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## In this Webinar...

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- X-Ray Use in Industry
- Regulatory Aspects
- X-Ray Radiation Safety Program Elements
  - Overall
  - Discussion of Some Specific Elements

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## X-Ray Use in Industry

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- Radiation is used widely in industry
  - EMF
  - Lasers
  - Radioactive material (e.g., nuclear gauges)
  - X-Rays
- X-Ray use varies
  - Cabinet systems
  - Conveyor systems
  - Open systems

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## Regulatory Aspects

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- Sale of X-Ray Equipment in Canada
  - Federal RED Act (Radiation Emitting Devices Act)
- Occupational Health and Safety
  - Federal Rules/Regulations
    - Federally regulated workplaces (e.g., airports)
    - X-Ray sources operating at very high energy (> 1 MeV) (NSCA and CNSC Regulations)
  - Provincial/Territorial Rules/Regulations
    - Pretty much everything else
    - Terms and requirements may differ between jurisdictions

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## X-Ray Radiation Safety Program

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Components to include in a radiation safety program for x-rays used in industry:

- Company Policy
- XSO
- Worker training, verification, & authorization
- Procedures
- Safety rules
- Emergency response
- Survey instruments
- Dosimetry
- Security
- Signage
- Waste management
- Record keeping
- Audits
- Reporting

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## Radiation Safety / ALARA Policy

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- Company policy outlining the company commitment to radiation safety
- Documents the commitment to keep doses received by workers and members of the public “As Low As Reasonably Achievable” (ALARA)
  - That it is **not sufficient** to simply respect the appropriate dose limits
  - Social and economic factors taken into account

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## X-Ray Safety Officer

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- A person, who is trained and knowledgeable about the safe use of the x-ray equipment and general radiation safety, should be designated as the person in charge of the safe use of the equipment
- Depending on the jurisdiction, this person may be given different titles in regulations
  - Radiation Protection Officer (RPO)
  - Competent Person
  - X-Ray Safety Officer (XSO)
  - Etc.

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## X-Ray Safety Officer

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- Depending on the jurisdiction, there may (or may not) be specific requirements for the qualifications for the XSO
  - Member of list of specialized professions (e.g., dentist, doctor, chiropractor, etc.)
  - Competent person
    - Understanding of: x-rays interactions, health hazards, use and operation of equipment, radiation safety practices

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## X-Ray Safety Officer

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- Duties may consist of
  - Registration of x-ray equipment
  - Directing safe use and operation of x-ray source
  - Informing workers that they are X-Ray Workers (Occupationally Exposed Workers, etc.), if applicable, and documenting this
  - Ensuring worker training/qualifications
  - Monitoring and reporting on worker doses
  - Ensuring adequate signage
  - Ensuring equipment is maintained
  - Reporting (incidents, equipment failures, etc.)

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## Worker training and qualification

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- Document method for worker designation
  - Member of the Public (not an X-Ray Worker, etc.)
  - X-Ray Worker (Nuclear Energy Worker, Occupationally Exposed Worker)
    - Informing the worker in writing (and receipt of written acceptance by the worker) may be required
- Document required qualifications and training
  - Who needs what level of training
    - Persons working with x-ray equipment need more training than those simply working in the area
  - Refresher training frequency


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## Work Procedures

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- Procedures
  - Procurement
  - Authorized users
  - Use procedures
    - Safety measures
    - Safe work habits
    - System parameters
  - Signs
  - Dosimetry



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## Work Procedures

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- Procedures, continued
  - Maintenance
  - Movement
  - Radiation surveys
  - Emergencies
  - Oversight or audit
  - Transfer or disposal?

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## Instruments

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- Radiation detection instrumentation
  - We cannot detect radiation ourselves.
  - We must use instruments to detect it.
- Ensure the correct type of instrument
  - Depending on the purpose of the survey and the quantity we wish to measure, we need different types of instruments
  - Some regulations specify area or surface x-ray limits in exposure rate or in air kerma


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## Instruments

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- Ensure instrument integrity
  - Calibration – every 12 months
    - Ensure correct energy calibration
  - Function check prior to EACH use
    - Visual check
    - Battery check
    - Calibration check
    - Response check



Credit: Ludlum Measurements, Inc. Model 16 Analyzer


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## Dosimeters

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- A dosimeter is a device which measures the total radiation dose over some time interval
- Dosimeters can be used for
  - X-rays
  - Gamma-rays
  - Other radiation types
- Dosimeter forms
  - Whole body badge type
  - Extremity ring type



Credit: Global Dosimetry Solutions

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## Dosimeters

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- Requirements for when dosimeters are needed vary with jurisdiction
  - Dose based
  - Occupation based
- Many jurisdictions require the use of dosimeters that are certified by the CNSC (TLDs and OSLs)

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## Wearing Dosimeters

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- Whole body dosimeters should be worn between the waist and neck
- They should be worn facing the radiation source
- Never share or wear another person's dosimeter
- Do not tamper with or intentionally expose a dosimeter to radiation
- If a dosimeter is lost, the worker should stop working with radiation until receiving a replacement.
  - The XSO may have to estimate the dose for the lost dosimeter.

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## Dosimeter Use

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- Whole body dosimeters should be worn between the waist and neck
  - They should be worn facing the radiation source
- Extremity dosimeters should be worn on both hands, or at least the dominant hand
- Never share or wear another person's dosimeter
- Do not tamper with or intentionally expose a dosimeter to radiation


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## Storing Dosimeters

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- If a dosimeter is lost, the worker should stop working with radiation until receiving a replacement.
  - The XSO may have to estimate the dose for the lost dosimeter.
- Store dosimeters in a holder or rack when not in use, in a low radiation area)
- It is good practice to keep extra dosimeters on hand as replacements for lost or damaged dosimeters



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## Records

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- Records to be kept
  - Procurement records
  - X-Ray system registrations
  - Work procedures
  - Maintenance records
  - Survey results
  - Worker classifications
  - Worker training, and training validation
  - Authorized user lists



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## Records

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- Records to be kept, cont'd
  - Instrument calibration records
  - Dosimetry results
  - Incident investigation reports
  - Internal review / audit results
  - Disposal records

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## Contact Us

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