



Conference of Radiation Control Program Directors, Inc.

NEWSBRIEF

www.crcpd.org

A Partnership Dedicated to Radiation Protection

August 2010

Message from Chairperson Michael Gilley



Welcome back from summer.

With the return to school and with the fall season just around the corner, we find ourselves settling down again to the business at hand. Have you ever wondered... “just what is our business?” State and federal programs have created great sounding mission statements then festooned them with a plethora of goals. Things that we proudly published, distributed, and then quickly filed away. Our profession (and the dedication of careers) is providing the leadership and technical expertise to help safeguard the public from the hazards of the use of radiation while enabling all of us to reap its benefits.

Over a half decade ago, the Conference brought attention to our profession via the creation, pronouncement, and promotion of the National Radiation Protection Professionals Week. The week of November that encompasses November 8th was chosen as the best time in recognition of the discovery of x-rays by Wilhelm Conrad Roentgen on November 8, 1895. The week was intended to bring attention to the significant contribution radiation protection professionals make every day to the nation’s health, defense, industry, and energy sectors. Many other radiation professional organizations recognized the significance of our proclamation and join the Conference and its membership in celebrating. Later that same fall, the 109th U.S. Congress endeavored to honor us by proposing a resolution dedicating that November week to our profession. Several state radiation programs were recognized

by legislative and executive proclamations.

Inside

Greeting from Executive Director	2
CRCPD Website Updates.....	5
Charles R. Meyer Joins CRCPD	6
National Radon Training Conference.....	6
Working Group Activities.....	8
H-7 Q.A. Collectible on Hand-Held Dental X-Ray Units.....	8
H-16 Joint Commission Liaison Report	8
H-38 Report	9
Remembering Jack Stanton.....	11
New Members/Classification Changes	12
Directory Changes.....	13
Contact Information on Board Members.....	14
Q.A. Collectible: Hand-Held Dental X-Ray Units	

This is a standalone document inserted at the end of the issue.

Again this year, the Board of Directors will proclaim and promote publicly the National Radiation Protection Professionals Week during November 7 through the 13, 2010. The Health Physics Society has taken the lead by being the first to declare its willingness to join the Conference again in this endeavor. It is time for us to act.

Chairperson's Message *[Continued]*

Your focus for this week is simple: get your management to recognize the week, and for you, use the opportunity to organize several activities for the radiation protection professionals in your organization to highlight their contributions to your missions and program goals. November is not too cold for a noon-time outdoor cookout, maybe a luncheon would work best for your staff, or in the best Texas tradition a staff meeting after work hours at a local hangout. Be sure to throw in some silly awards (like gamma-sponge awards for the most doses received by the inspecting staff last year); certificates (for those who have made a difference no matter how small they may seem); and don't forget to reminisce about how some thorny issues or humorous events this year actually turned out beneficial to your program.

It's all about not forgetting the little things. The reason for this season is to recognize our valuable radiation professionals that have devoted their careers to allow others to safely use radiation for the benefit of all.

See you again in October.



Greetings from Your Executive Director



Ruth E. McBurney, CHP

More Planes, Trains, and Automobiles

Over the past couple of months, I think I have traveled on all kinds of transport except a ship in getting to all the places where CRCPD is working these days.

Kentucky in July

Radon Leaders Saving Lives, a partnership made up of EPA, CRCPD, and the American Association of Radon Scientists and Technologists, provided an exhibit at the annual meeting of the National Conference of State Legislatures (NCSL) in Louisville, Kentucky, during the last week of July. Jeggan Cole and I assisted in the booth and attended a breakfast sponsored by CRCPD for state legislators to provide information on radon and what is being done in the states on this issue. At the exhibit, a small recording booth was provided to give legislators an opportunity to record a



At the exhibit are William Angell, president of AARST, and Clay Hardwick, Kentucky Radon Program.

Greetings from Your Executive Director

[Continued]



Speakers at CRCPD's sponsored breakfast—Left to right: Illinois State Representative Dan Reitz, Kentucky State Representative Steve Riggs, and Bruce Snead, Kansas State University.

public service announcement on radon that will be sent to radio stations in each legislator's local area for use during January—Radon Action Month.

While in Kentucky that week, Russ Meyer and I visited with the OED staff in Frankfort. I want to take this opportunity to welcome Russ as the new Technical Assistant (TA) at CRCPD (see article elsewhere in the Newsbrief) and to thank Chuck Hardin for filling in as Interim Technical Assistant during the time we were in the hiring process for the new TA. This definitely made the transition run so much more smoothly than if Chuck had not been available for those couple of months.

DC in August

During the second week in August, Alice Rogers (Chair-Elect), Adela Salame-Alfie (Past Chair) and I visited with several of our federal partners and other professional organizations' staff and discussed a variety of current topics with them. It took lots of Metro stops and cab rides to get to all the places inside and outside the Beltway, but we managed to do it in four days. Some of the key issues discussed were as follows:

FEMA: New Radiological Emergency Preparedness Program Manual—implementation guidance to states; greater potential involvement of state radiation control program staff in evaluation of exercises; implementation guidance on Ingestion Pathway Exercises; other opportunities for state involvement in radiological emergency preparedness issues, to include major non-power plant incidents.

Greetings from Your Executive Director

[Continued]

- DOE:** Voluntary physical protection upgrades; future efforts in source disposition; GTCC waste disposal.
- EPA:** Radon initiatives; radiation standards being developed by EPA; Granite Countertops Study; Federal Guidance update; emergency response activities.
- NRC:** (with OAS) Physical security regulations; waste disposal issues; coordination between OAS and CRCPD: medical event tracking, safety culture, general rulemaking and compatibility.
- FDA:** Medical events; CT protocols and training; Nationwide Evaluation of X-Ray Trends



NRC meeting. Left to Right: Commissioner William D. Magwood, IV, David Walter, OAS Chairperson (AL), Alice Rogers, CRCPD Chair-Elect (TX), Commissioner Kristine L. Sivinicki, Adela Salame-Alfie, CRCPD Past Chairperson (NY), Lee Cox, OAS Director of Emerging Issues and Advocacy (NC), Chairman Gregory B. Jaczko, Commissioner George Apostolakis, and Commissioner William C. Ostendorff.

We also visited with staff of the American College of Radiology, the American Association of Physicists in Medicine, and the American Society for Radiation Oncology, and were asked to brief staffers of the House Committee on Energy and Commerce on CRCPD activities regarding medical events.

Upcoming Summit on Radiological Preparedness and Public Health

A conference entitled “Bridging the Gaps: Public Health and Radiation Emergency Preparedness” is being planned for March

Greetings from Your Executive Director

[Continued]

21-24, 2011, in Atlanta to prepare the public health and clinician workforce for radiological and nuclear terrorism incidents. The Radiation Studies Branch at the Centers for Disease Control and Prevention (CDC) is sponsoring the event and involving CRCPD as well as public health organizations, the Medical Reserve Corps, Red Cross, and risk communication experts in the planning and implementation of the conference.

The primary goals of this conference are to: provide a forum to discuss the current state of radiation emergency preparedness, including gaps and barriers, at the local, state, and federal levels; share promising practices and practical applications to enhance radiological preparedness; and create a network of public health professionals and other stakeholders committed to advancing the field of radiation emergency preparedness.

This promises to be an exciting and rewarding conference. Several CRCPD members, as well as representatives from the other organizations and agencies, recently attended a planning session for the conference, and were pleased with the synergy and interest shown among the public health organizations represented in this important issue. Stay tuned for more information on the event.

There will be much more work involving planes, trains and automobiles (as well as desk chairs and computers) in the weeks to come, but this is a sampling of what's going on now. I hope you will continue to bring new issues to the forefront so that, as an organization, we can address it together more efficiently than on your own.



CRCPD Website Updates

By Bruce Hirschler (OED)

CRCPD recently contracted with Daxko of Birmingham, Alabama, to provide our users and members a greater range of service through our website. This new service will be most noticeable when users log into crcpd.org. Sometime in September, everyone that has logged into CRCPD's website in the past will be notified with instructions on how to log in to this new portion of our website. Registrations for the 20th National Radon Training Conference will be one of the first tasks that users will be able to complete using this new service, as well as membership renewal, which is also coming up in October. More new features will be added over the next several months.

CRCPD Website Updates *[Continued]*

Charles R. Meyer joins CRCPD as the Technical Assistant

CRCPD will also be conducting a survey for further improvements on our website on how to better serve our users. Your input would be welcomed.



The Office of Executive Director is pleased to announce the hiring of Charles R. (Russ) Meyer as the Technical Assistant. Russ will be responsible for the Orphan Radioactive Material Disposition Program and the Source Collection and Threat Reduction Program (SCATR), as well as managing the CRCPD Department of Transportation special permits for radioactivity in scrap and sanitary landfill loads. Russ will be telecommuting from Round Rock, Texas, but will be reachable by e-mail <rmeyer@crcpd.org> and telephone at 512/761-3822.



Russ is a Certified Health Physicist and has had extensive regulatory and waste management experience, having spent over 25 years with the Texas Radiation Control Program, where he served as an inspector, radiation safety officer, and environmental monitoring and transportation expert, and several years in radiation safety with U.S. Ecology. Welcome to Russ to the OED staff!



Announcement and Invitation

20th National Radon Training Conference

October 17 – 20, 2010

Hyatt Regency at the Convention Center, Columbus, Ohio,

The Conference of Radiation Control Program Directors, Inc. (CRCPD) is sponsoring this conference and training with financial assistance from the Office of Radiation and Indoor Air, U.S. Environmental Protection Agency (EPA).

We invite you to join us in Columbus, Ohio, and look forward to seeing you there. [Please click here for a tentative agenda and other important information about this conference.](#)

20th National Radon Training Conference

[Continued]

All of the information in this announcement and invitation, along with additional items or changes when they become available, will be available on [CRCPD's website](#). Check the website for all updates.

Calendar of Events

Sunday, October 17, 2010

Continuing Education Training (in conjunction with the National Radon Training Conference)

- Radon Measurement QA – QC: Model Regulation (8:00 a.m. – 12:00 p.m.) (Presented by: Suggested State Regulations Committee – Part R: Radon, SR-R)
- Social Marketing and Actionable Messaging (8:00 a.m. – 12:00 p.m.) (Presented by: Kristy Miller (EPA), Michael Pyles (PA), and Cindy Ladage (IL))
- Principles of Airflow in Pipes for State Radon System Investigators – Hands-On (1:30 p.m. – 4:30 p.m.) (Presented by: William J. Bell, Josh Miller, Josh Kerber, and Marybeth Rich, E-25 Committee on Radon members and advisors)
- Reception (6:00 p.m. – 8:00 p.m.)

Monday, October 18, 2010

Opening Session of the 20th National Radon Training Conference – Joint with the American Association of Radon Scientists and Technologists (AARST) (8:00 a.m. – 12:00 p.m.)

- Awards Luncheon (12:00 p.m. – 1:30 p.m.)
- Radon Resistant New Construction (1:30 p.m. – 3:35 p.m.)
- Raising the Public's Awareness (3:35 p.m. – 5:00 p.m.)

Tuesday, October 19, 2010

- SIRG (8:15 a.m. – 10:00 a.m.)
- Using Data to Save Lives (10:30 a.m. – 11:30 a.m.)
- Technical Nuts and Bolts (The View from the Suction Point) (1:00 p.m. – 5:00 p.m.)
- Night Out (6:30 p.m. – 10:00 p.m.)

20th National Radon Training Conference Calendar of Events

[Continued]

CRCPD Working Group Activities



Wednesday, October 20, 2010

- Communication and Outreach (8:30 a.m. – 1:15 p.m.)
- Planning Development and Working Session (1:15 p.m. – 3:30 p.m.)



Q.A. Collectible on Hand-Held Dental X-Ray Units

By Robert Scott, Chair, H-7 Committee on Quality Assurance in Diagnostic X-Ray (PA)

The newest Collectible on Hand-Held Dental X-Ray Units is provided as an insert at the end of this issue. This collectible contains information about the design and use of these units. Some preliminary dosimetry data and radiation safety considerations are also presented.



Joint Commission (JC) Liaison Summary Report

By Robert Ray Dielman, H-16 Liaison (FL)

I attended the JC Liaison meeting in Oak Brook (Chicago), Illinois, July 11 – 14, 2010.

The JC mission is to focus on health care organizations achieving high reliability and a safety culture. Further, JC has created a partner organization to transform health care and provide solutions to common problems. JC continues to evolve evidence based standards and national patient safety goals (NPSG).

The JC perceives CRCPD as a partner in patient safety and as their patient radiation safety resource. This was publically noted as a learning point by a JC speaker who indicated CRCPD had advised of radiation safety challenges (fluoroscopy, CT, etc) not acknowledged in the field by practitioners but recently demonstrated by the media and will lead to new standards and possibly an NPSG. Other JC/CRCPD partnering includes fluoroscopy standards, sentinel event, radiation safety assessment tools for surveyors, continuing as a JC resource to resolve radiation related problems discerned in the field by surveyors, regulators and facilities, and methods to strengthen our relationship.

Recently JC was approved, along with the ACR and ICA, as recognized accreditors of advanced diagnostic imaging modalities by CMS. We participated in an impromptu meeting of representatives from JC, ASRT, AAPM, SNM, and MRI. Some

CRCPD Working Group Activities *[Continued]*

Joint Commission Report *[Continued]*

participants/competitors expressed uncertainty about the JC criteria and approach to responsibility accreditation.

In April 2010 H-16, and others, participated in the development of the JC accreditation criteria and the JC surveyor guide. During this meeting we were requested to, and provided, advice on additional criteria editing and refinements, all with a view toward congruency with the related SSR's, as applicable.

Finally, significant new and continuing activity is anticipated in the JC/CRCPD relationship on the short and long term.



H-38 Committee Report

By Jennifer Elee, Chair, H-38 Committee on Non-Radioactive Materials Medical Events Tracking (LA)

The H-38 Committee on Non-Radioactive Materials Medical Events Tracking met in Miami, Florida on June 22 and 23, 2010. Attendees were Jennifer Elee, LA; Janaki Krishnamoorthy, NY; John Winston, PA; Jim Castle, OH; Jimmy Carson, MS; Debbie Gilley, FL; Lynne Fairbent, AAPM; Ralph Lieto, AAPM; Emily Wilson, ASTRO; Barbara Muth, ASTRO; Eugenia Brandt, ACR (via conference call).

The committee reviewed the current charges of the committee and made several recommendations to the Healing Arts Council Chair for changes to the charges. The committee also suggested the committee name be changed to Committee on Radiation Medical Events. At the suggestion of the ASTRO, ACR and AAPM resource individuals, the committee agreed to look into the feasibility of a single nationwide database for medical events that would incorporate both material and machine events.

The committee spent a great deal of the meeting in completing their second charge, which is to develop a definition of radiation producing machine radiation medical event for both diagnostic and therapy events. The committee felt that it was important to include not only those items that are required to be reported by the Suggested State Regulations, but other items of importance. The committee came up with a draft definition for both therapy use and for diagnostic use. The new definition has been forwarded to our federal partners, advisors and other experts for comment.

CRCPD Working Group Activities *[Continued]*

H-38 Committee Report *[Continued]*

The committee also developed more detailed questions for a second survey of state program directors. The committee hopes to get more information about how many events are being reported and what the states are doing with the information they receive. ASTRO and AAPM would like this information to help develop reports for future congressional hearings on medical events. The committee will follow up by phone with those states that do not complete the survey.

The committee discussed the development of a reporting form. The committee reviewed the New York State, ROSIS, and NMED forms. The committee decided to defer further development of a form until we are able to gather more information on the direction of the federal government and other agencies. The committee felt the form should be short, easy to use, with drop down menus where appropriate. There should also be ample room for comments.

John Winston and Debbie Gilley attended the AAPM annual meeting in Philadelphia in July. The committee developed a panel summarizing our efforts to display as part of the CRCPD booth at the AAPM meeting. In addition to the panel, the committee developed a short three question survey to gather information from AAPM attendees regarding their thoughts on Radiation Medical Events.

At the conclusion of the committee meeting, most of the committee members stayed in Miami to attend the *AAPM Safety in Radiation Therapy – A Call to Action*. This meeting was prompted by the recent articles and reports on medical events in facilities providing radiation therapy and the subsequent Congressional Hearings.

The meeting featured presentations by representatives from vendors, regulators and users. Radiation therapy has become more and more complex with the development of computer technology. The incidence of medical events remains low and everyone is striving to minimize such occurrences.

Several themes held throughout the meeting, such as the need to have an open proactive dialogue between everyone. Many of the speakers promoted the use of timeouts and checklists to minimize the human error element and supported the entitlement of anyone on the oncology team to stop and question. Minimizing

CRCPD Working Group Activities *[Continued]*

H-38 Committee Report *[Continued]*

distractions such as pagers, cell phones, and high traffic during patient setup will positively impact human error. The term “safety culture” was used often.

Debbie Gilley made a presentation on the state’s response to two different events, one material based and one machine based. The presentation showed how the responses to the two events were alike and different. Jennifer Elee presented a summary of the H-38 Committee on Non-Radioactive materials medical events tracking activities.

As part of the meeting several questions were put to the audience for response. Several of the responses were of interest to this committee. Attendees overwhelmingly voted they would voluntarily participate in a medical events database. About 65% voted they would prefer an entity other than FDA or NRC to maintain it. A facility’s ability to receive and review information on a medical event in a timely manner is essential.

The committee plans to meet via conference call in late summer to discuss the comments received on the definition of a radiation producing machine based radiation medical event and the second survey of the state program directors.



Remembering Jack Stanton

By Dennis O’ Dowd (NH)

I am saddened to report to you the passing of John (“Jack”) R. Stanton, who died on July 5, 2010, after a long illness. He was 76 years old.

Jack, a lifelong resident of Manchester, New Hampshire, was a former Director of the New Hampshire Radiation Control Agency, and later, an Assistant Director of the state’s Public Health Division, retiring in that position in 1997. Including his post-retirement activities as a member of state’s Health Services Planning and Review Board, Jack dedicated nearly 50 years of public health service to the citizens of New Hampshire.

Jack served several years on the Board of Directors for the Conference of Radiation Control Program Directors, Inc. (CRCPD), including his tenure as Chairperson from 1981–82, and he made many valuable contributions to the organization. He was one of the early pioneers in the development of the very successful

Remembering Jack Stanton

[Continued]

Nationwide Evaluation of X-ray Trends (NEXT) program, serving as one of the committee's chairmen during the committee's developing years. Under his leadership, this program developed into a unique methodology to measure the effectiveness of state x-ray programs.

Jack's other passions were languages (he was a linguist who spoke French fluently, and had mastered Gaelic and Esperanto(!)). Early on in his life, he served in the U.S. Army and the New Hampshire Army National Guard and retired as warrant officer. He was also a justice of the peace and a notary public. He was a member of the Ancient Order of Hibernians and its St. Patrick's Day Parade Committee in Manchester, New Hampshire, the American-Canadian Genealogical Society, and was a regular volunteer of its library. Jack volunteered at the website Random Acts of Genealogical Kindness.

Jack will be long remembered, not only for his contributions to the state of New Hampshire's public health programs, especially its radiation control program, as well as for his support of national public health goals, but most of all, for his brilliance, intelligence, and humor, and for his love of sharing his knowledge with others. He was an exceptional teacher and mentor, and he will be missed by all who knew him.

I ask that you remember his family in your thoughts and prayers.



New Members/ Classification Changes

Director Members

Lundberg, Rusty (UT)
Rusin, Raymond (RI)
Shults, Debra (TN)
Yale, Ken (MI)

Associate Members

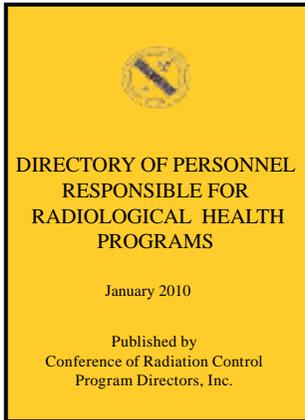
Eggers, Emily (WI)
Kelly, James (MN)
Nanney, Ed (TN)
Paulson, Mark (WI)
Taylor, Barbara J. (TX)
Zhu, Shunlai (WI)

Affiliate Members

Hill, David (MA)
Johnson, Paul (OH)
Nelson, Brigitte (FL)
Vastagh, Stephen (VA)
Wiley, Albert (TN)



Directory Changes



- Page 34 - KY - Remove Dewey Crawford and insert Matthew W. McKinley, Interim Administrator, phone: 502/564-3700, Ext. 3701, e-mail: <mattheww.mckinley@ky.gov>.
- Page 36 - ME - Remove Shawn Seeley and insert vacant.
- Page 42 - MI - Change to Department of Natural Resources and Environment; insert new phone number for Statewide 24-Hour Emergency Notification to 517/214-8000 and fax: 517/373-4797; remove Thor Strong in its entirety and insert Ken Yale, Acting Chief, Radiological Protection Section, Environmental Resource Management Division, MI Dept. of Natural Resources and Environment, P. O. Box 30241, Lansing, MI 4890-7741, phone: 517/241-1278, e-mail: <yalek@michigan.gov>, fax: 502/517-373-4797, and REP Contact.
- Page 77 - TN - Remove Edward Lawrence Nanney and insert Debra G. Shults, Acting Director, phone: 615/532-0364, e-mail: <debra.shults@tn.gov>.
- Page 83 - UT - Remove Dane Finerfrock and insert Rusty Lundberg, new zip code 84116, e-mail: <rlundberg@utah.gov>.



CRCPD Board of Directors

Board position	Name	State	Work Phone	E-mail address
Chairperson.....	Michael Gilley.....	Florida.....	850/245-4545	✉ norman_gilley@doh.state.fl.usN
Chairperson-Elect	Alice Rogers, PE.....	Texas	512/834-6629	✉ Office.rogers@dshs.state.tx.us>
Past Chairperson	Adela Salame-Alfie, Ph.D. ...	New York.....	518/402-7501	✉ asa01@health.state.ny.us>
Treasurer.....	Terry Frazee.....	Washington.....	360/236-3213	✉ terry.frazee@doh.wa.gov>
Member-at-Large	Frieda Fisher-Tyler, CIH.....	Delaware.....	302/744-4546	✉ frieda.fisher-tyler@state.de.us>
Member-at-Large	Earl Fordham, CHP	Washington.....	509/946-0234	✉ earl.fordham@doh.wa.gov>
Member-at-Large	Mary Ann Spohrer.....	Illinois.....	217/785-9916	✉ maryann.spohrer@illinois.gov>

The Newsbrief is published in February, April, June, August, October, and December by the Office of Executive Director, Conference of Radiation Control Program Directors, Inc., 1030 Burlington Lane, Suite 4B, Frankfort, KY 40601. Telephone: 502/227-4543; fax: 502/227-7862; Web site: <www.crcpd.org>.

The Newsbrief is written to address the needs of all radiation control program personnel. Readers are encouraged to contribute newsworthy or informative items for the Newsbrief, with neither charges nor stipends for the items that are selected. News of state radiation control programs is especially sought.

Articles should be sent to CRCPD, Attn: Sue Smith, 1030 Burlington Lane, Suite 4B, Frankfort, KY 40601 (fax: 502/227-7862; email: <ssmith@crcpd.org>). The deadline for contributions is the 15th of the month before an issue is to be published.

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This publication is supported in part by a Cooperative Agreement (No. FD-000005) administered by the Food and Drug Administration.

Q.A. COLLECTIBLE

*Sponsored by CRCPD's Committee on Quality Assurance
In Diagnostic X-Ray (H-7)*

HAND-HELD DENTAL X-RAY UNITS

INTRODUCTION

Currently, there are several manufacturers who make hand-held dental x-ray units. Of those, several of these units have received U.S. Food and Drug Administration (FDA) clearance to be marketed for human use in the United States. One manufacturer/unit is designated for non human use (veterinary unit). At least two systems of hand-held dental x-ray devices have been cleared for marketing in the United States. FDA has a website for all device approvals and clearances:

<http://www.fda.gov/MedicalDevices/ProductsandMedicalProcedures/DeviceApprovalsandClearances/default.htm>

The main advantages of a hand-held dental x-ray device are mobility and positioning. One device can be used in multiple dental operatories or easily transported to remote locations like nursing homes or temporary health clinics. The operator isn't limited to how far a support arm can move or if the dental chair must be positioned in a specific direction or orientation. They also allow for easy adjustments for limited patient flexibility.

RADIATION DOSE / EXPOSURE

Two potential negative issues arise from the use of hand-held x-ray devices: operator dose and increased patient dose.

Operator Dose

Sources of operator dose include: tube leakage radiation to the operators' hands and back-scatter dose to the operators' hands and body. Because the operator is holding the device, their ability to use distance as a protection factor is limited to the length of their arm. Time of exposure is defined by the anatomy (exposure factors kVp and mA are fixed). That leaves shielding as the default means of operator protection.

Like most dental units, the x-ray tube, x-ray control circuitry, and high voltage generator (transformer) are all contained in a single, lead-shielded housing. All FDA cleared units have shielding sufficient to meet the leakage radiation requirement under 21 CFR 1020.30(k) (0.88 mGy or 100 mR in an hour). The dose to the operator varies based on the unit's design.

Back-scatter from the patient also adds to the potential operator dose. A properly deployed lead acrylic disk surrounding the exposure aperture cylinder absorbs virtually all back-scatter and limits this unnecessary dose.

Patient Dose

Increased patient dose could come from: inconsistent source-to-image distances, central ray angles (image cut off), repeated exams due to motion of the operator, or errors in central ray angles (image quality-elongation or foreshortening). Another potential issue is movement. If the tube moves due to length of exposure time or the operator moving (breathing or the fatigue related to unit weight), there is loss of image detail. This may be minimal due to the amount of motion and the relative geometry of the film and anatomy, but could lead to repeated exams. Motion can be minimized by using F-speed dental film, or solid state digital imaging systems, and with units using higher tube current (mA).

Technique charts are established based on an x-ray unit's radiation output, patient anatomy to be imaged, image receptor system, and source-to-image distance (SID). The anatomy, output, and image system, once established, generally remain consistent. In general, the SID for dental units is operator dependant. For hand-held dental units, SID is totally operator dependant. Dental assistants are taught during their training that the end of the cylinder should not touch the patient. Positioning arms and aiming rings (a film or digital sensor holder with a ring for positioning the x-ray tube cone) are available to assist in proper positioning of the x-ray tube relative to the image sensor and in avoiding cone cutting or misalignment of the x-ray tube with the image sensor. If properly used, these also assure that a consistent source-to-image distance is maintained by the operator. These should be used for hand-held units also.

Any hand-held unit sold in the U.S. must meet the minimum 18 cm source-to-skin (end of cylinder) distance required by the FDA. It should be stressed that some hand-held devices significantly reduce the patient (and staff) dose through optimized design. This is accomplished by using

direct current to the x-ray tube, smaller cylinder diameters, and fully lead shielded cylinders.

DESIGNS FOR HAND-HELD DENTAL DEVICES

The hand-held dental x-ray units approved for sale in the United States have two basic design shapes. The first design has a handle and trigger device similar to a hand-held “cutie pie meter.”

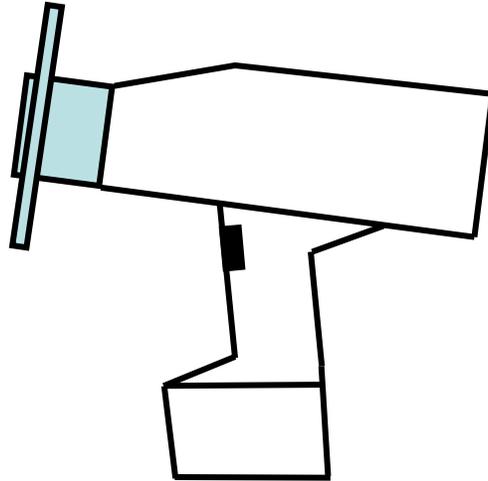


Figure A. Design similar to a cutie-pie meter with an integral back-scatter shield.

The second design resembles a digital camera:

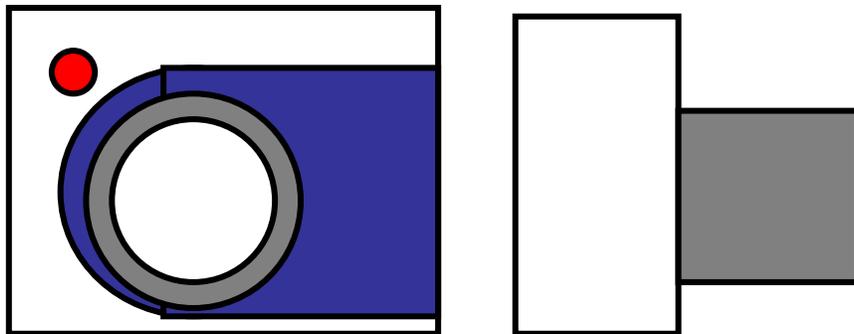


Figure B. Digital camera design hand-held x-ray unit. There can be some variation in cylinder aperture (cone) length. At least one of the manufacturers using the camera body design offers an optional back-scatter shield.

Although the hand-held dental x-ray units operate at fixed kVp and mA factors (all units use 60 kVp and mA varies by manufacturer from 1.0 – 2.5 mA), the exposure times have a range from 0.03 – 2.0 sec. All utilize focal spots comparable to traditional dental units that have their tube heads affixed to a support arm. Focal spot sizes range from 0.4 to 0.8 mm, which is similar to that used in wall-mounted units. The hand-held x-ray units are also comparable to traditional dental units in radiation output.

X-RAY UNIT SAFETY

Radiation tests conducted on four hand-held dental x-ray devices by Washington State x-ray inspection personnel demonstrated that operator exposure varies widely from one device to another. The testing also demonstrated that while no hand-held dental device exceeded established occupational dose limits for extremities, the tested leakage exposure to the hands ranged from minimal to 270 mrem (2.7 mSv) from a total of 750 exposures. All tested units had exposure factors adjusted to equivalent radiation output of 130 mR (1.14 mGy) ESE (within 10%).

The highest dose observed was at the exposure switch location (i.e., right finger)

$270 \text{ mrem (2.7 mSv)}/750 \text{ exposure} = 0.36 \text{ mrem (0.0036 mSv)}/\text{exposure}$

$750 \text{ exp}/\text{by } 22 \text{ work days} = 34 \text{ exp}/\text{day (22 work days equivalent to one month)}$;

8-9 patients if 4 exposures per patient or 17 patients if two bitewings only

$34 \text{ exp}/\text{day} \times 0.36 \text{ mrem (0.0036 mSv)}/\text{exposure} = 12 \text{ mrem}/\text{day}$
{this is to the finger and would not exceed the maximum permissible dose (MPD) of 50 rem (500 mSv) per year}

For a given month, the worst possible scenario for hand-held units would not exceed occupational limits. However leakage dose to the hands may be a concern.

Radiation Dose to the Operator

Measurements of operator dose from back-scatter were taken for various parts of the body. Back-scatter shields are available for some units

(may be integral or optional). All measurements with the back-scatter shield in place were minimal.

The highest dose (to the operator's abdomen) was measured without a back-scatter shield.

$$60 \text{ mrem (0.6 mSv)}/750 \text{ exp} = .08 \text{ mrem (0.008 mSv)}/\text{exp}$$

$$34 \text{ exp}/\text{day} \times .08 \text{ mrem (0.008 mSv)}/\text{exp} = \\ 2.72 \text{ mrem (0.0272 mSv)}/\text{day}$$

$$2.72 \text{ mrem}/\text{day} \times 250 \text{ working days} = 680 \text{ mrem}/\text{year}$$

Again, no unit tested would exceed occupational dose limits. However, ALARA (as low as reasonably achievable) guidelines would be better followed if a back-scatter shield is utilized/required. A back-scatter shield is most effective when positioned at the end of the cylinder (closest to the patient) because that provides a larger protective area for the operator.

QUALITY CONTROL TESTING

Quality control testing is not addressed specifically by all manufacturers. Ideally, prior to use on humans, some quality control should occur. The facility should contact the manufacturer for an appropriate quality control procedure.

SUMMARY

In summary, there are several hand-held x-ray units available in the United States. These have some distinct advantages for the users but also have drawbacks with regard to user radiation safety. It should be noted that each model of hand-held x-ray units should be evaluated individually for safety purposes as the design characteristics vary significantly from one manufacturer to another.

The following points should be stressed for the users of hand-held dental, or other types, of x-ray units:

- Some units result in radiation doses to the hands on the order of 3,000 mrem per year, and to the body of 680 mrem per year. Although this is below regulatory limits, use of a

(may be integral or optional). All measurements with the back-scatter shield in place were minimal.

The highest dose (to the operator's abdomen) was measured without a back-scatter shield.

$$60 \text{ mrem (0.6 mSv)}/750 \text{ exp} = .08 \text{ mrem (0.008 mSv)}/\text{exp}$$

$$34 \text{ exp}/\text{day} \times .08 \text{ mrem (0.008 mSv)}/\text{exp} = \\ 2.72 \text{ mrem (0.0272 mSv)}/\text{day}$$

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- Some units result in radiation doses to the hands on the order of 3,000 mrem per year, and to the body of 680 mrem per year. Although this is below regulatory limits, use of a

shield significantly reduces the amount of back-scattered radiation received by the user.

- Higher tube current (mA) reduces exposure time and the potential for motion blur.
- Reducing exposure time by using a high speed image receptor, (F-speed dental film, or solid-state digital imaging systems), significantly decreases patient exposure and the potential for motion blur. In addition, use of F-speed film, or solid state digital imaging systems, significantly reduces the dose, i.e., by a factor of two, to the patient and staff
- Use of an aiming ring will minimize cone cutting and x-ray tube image receptor misalignment.

The information contained herein is for guidance. The implementation and use of the information and recommendations are at the discretion of the user. The mention of commercial products, their sources, or their use in connection with material reported herein is not to be construed as either an actual or implied endorsement by CRCPD.