VERMONT
DEPARTMENT OF HEALTH

ANNUAL X-RAY INSPECTION REPORT 2013
RADIOLOGICAL HEALTH

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

A total of 127 x-ray facilities were inspected in 2013. Out of the 127 facilities 71 (56%) were in full compliance at the time of the inspection. Forty five (80%) of those facilities not in compliance came into compliance after the inspection.

The National Council on Radiation Protection and Measurements (NCRP) recommends that medical facilities (which includes chiropractic facilities) be inspected every two years. Dental and veterinary facilities are recommended to be inspected evey 4 years. Podiatric facilities are inspected every 4 years since the x-ray machines are similar to dental x-ray machines.

The main area of concern is the lack of satisfactory lead aprons. Lead aprons are available in the facilites but some are cracked or torn. The facilities are encouraged to obtain new lead aprons and check them annually. Other non-compliance items are listed on pages 5 to 9.

Annual dose rates to all operators of x-ray equipment of the facilities inspected were less than the maximum allowed limit of 5000 millirem, typically less than 1% of this limit. Annual dose rates to the public were less than the maximum allowed limits of 100 millirem, except for one facility. The dose to the public was measured at a distance of less than usual 6 feet due to the layout of the facility. The facility does not allow members of the public in that area during an x-ray examination.

The entrance skin exposure to the patient was within the appropriate limit for all facilities.

The dose to the patient and the dose to the operator is less for all x-ray facilities that use faster speed film. This can be observed most clearly for the dental facilities. As the speed of the film increases from "D" to "F" the average dose per exposure decreases from 0.47 to 0.26 millirem. It should also be noted that the use of digital x-ray again decreases the average dose per exposure from 0.26 millirem for "F" speed film to 0.15 millirem for direct digital x-rays. Doses from computed radiography (CR) are similar to doses from F speed film (0.25 and 0.26 millirem, respectively).

It is expected that as more digital x-rays are used we will see decreases in the total facility noncompliances because darkrooms, safelights, film, and processing are no longer needed. Fifty seven percent of dental, 44% of veterinary, 71% of medical, 7% of podiatric and 15% of chiropractic facilities are using digital x-ray. Fifty percent of all facilities are now using digital x-rays.

OVERVIEW

To be conservative, exposures to the operator and public are measured at the configuration of highest exposure possible. Exposure to the public is performed by aiming the x-ray tube out of the exam room door from approximately the patient position for an x-ray exam and measuring the exposure at the doorway where the public passes by in the hall. Operator exposures are measured at the position the operator stands when making the exposure as indicated by the facility.

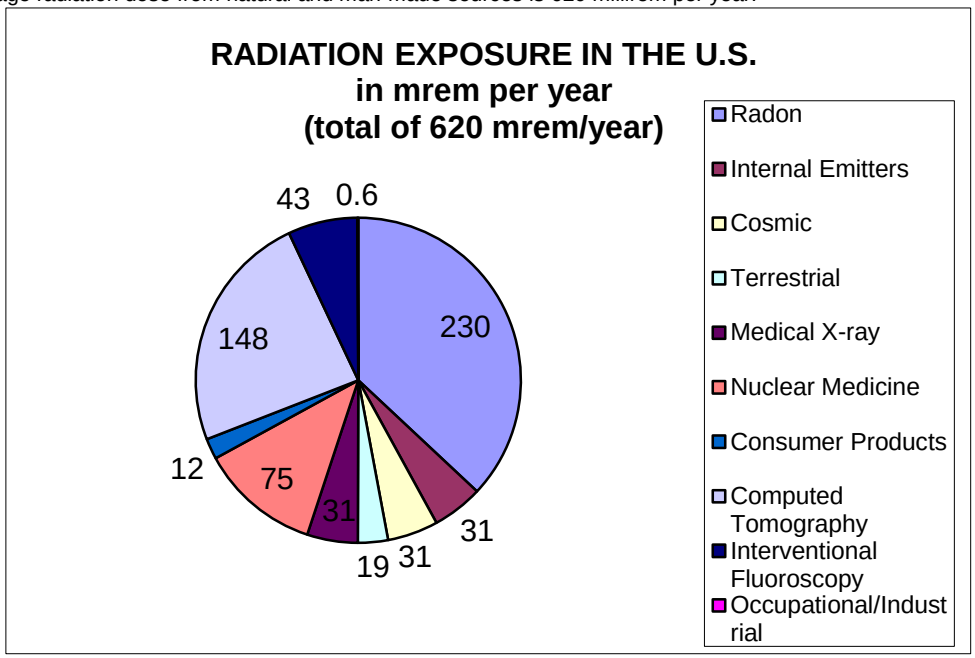
Operator and public exposures are measured in milliroentgen per hour using a Victoreen 471 ion chamber. The exposure per hour is converted to annual dose by converting hours to year and milliroentgen to rem using the number of x-rays the facility takes within a given period of time. 1 milliroentgen is equal 0.5 millirem (American National Standard Institute 6.1.1-1991) for whole body exposure from scattered radiation for the public and operators.

Patient exposures are measured in milliroentgen using an Unfors Xi. Patient exposures are converted from milliroentgen to millirem using the following factors based on the organ of greatest risk. Multiplication of the factor by the number of milliroentgen per exam results in the dose in millirem.

EXAM TYPE	FACTOR	ORGAN
Dental	0.0015	brain
PA Chest	0.1044	lung
AP Cervical Spine	0.0435	thyroid
AP Thoracic Spine	0.1044	lung
AP Lumbar Spine	0.1044	stomach/colon
AP Abdomen	0.1044	stomach/colon
AP Retrograde	0.1044	stomach/colon
Lateral Skull	0.0218	brain
Hand	0.0087	skin
Wrist	0.0087	skin
Arm	0.1044	bone marrow
Shoulder	0.1044	bone marrow
Leg	0.1044	bone marrow
Knee	0.1044	bone marrow
Ankle	0.0087	skin
DP Foot	0.0087	skin
Lateral Foot	0.0087	skin

Adapted from National Council on Radiation Protection and Measurements Report No. 116 tissue weighting factors and conversion factor from roentgen to rad of 0.87 rad/roentgen.

The average radiation dose from natural and man-made sources is 620 millirem per year.



Adapted from NCRP Report No. 160, 2009, Ionizing Radiation Exposure of the Population of the United States.

INSPECTION ITEMS

The following boxed sections indicate the individual items that are specifically looked at during an inspection for the following general groups: film/screen, processing, darkroom/safelight, personnel monitoring, patient shielding, collimation, timer, kVp and filtration, patient entrance skin exposure criteria, public exposure criteria, operator conditions, and physical condition (x-ray unit, shielding, etc.)

Some inspection items may pertain only to specific types of facilities. For example, repeat rate analyses pertain only to chiropractic facilities, whereas panoramic units pertain only to dental facilities. There are also inspection items that cover all facilities (e.g., registration of all x-ray units).

New facilities are not cited for non-compliant items. However, they are given a period of approximately one month to correct any non-compliant items found in the initial inspection.

Film/screen	Dental film is less than E speed
	X-ray film speed is less than 400
	Film is not protected from scatter radiation
	Film is not stored properly
	Film is exposed to chemicals
	Out of date film is used
	Film and screen types not matched
	No screen installation date is on outside of cassette
	Screen and cassettes are not of the same type or age
	Screen cleaning interval is inadequate
	Screen cleaning solution and lint free wipes are not used per manufacturer instructions
	Cassette check is inadequate
	Cassetes are not permanently identified for their type of use
	Film viewbox is not available
	Film viewbox is not cleaned periodically
	Viewbox bulbs are not of the same intensity and color
	Luminance of viewboxes is not similar
	Viewbox bulbs are not replaced annually
	Technique factors are not recorded in the patient log book
	Technique charts are not available or up to date
	Left/right markers are not used on clinical radiographs
	Clinical radiographs are not properly identified

Processing	Thermometer is not available for manual processing
	Timer is not available for manual processing
	Floating cover is not present for manual processing
	Sight devevelopment is used
	No evidence of daily log is kept
	Developing technique recommended by the manufacturer is not used
	Developer and fixer temperature are not maintained in limits
	Processor cleaning interval is inadequate
	Processor is not operating properly
	Processor cleaning date is not recorded
	Clean-up film for processing all x-ray films (except intra-oral) are not run
Darkroom/Safelight	Safelight bulb is greater than 15 W
	Safelight is too close to the work area
	Light leaks are detected in the safelight housing
	Light leaks are detected in the safelight lens
	Safelight is improperly filtered
	Darkroom is not light tight
	Darkroom is not free of dust and dirt
	Daylight processor arm cuffs are not acceptable
	Daylight processor is not light tight
	Darkroom temperature/humidity are not acceptable
	There are other light sources present in the dark room
Personnel Monitoring	Personnel monitoring devices are required
	Control dosimeters are not properly used or stored
	Employee dosimeters are not properly used
	Employee dosimeters are not properly stored
	No evidence of employee review of records
	Personnel monitoring records are incomplete
	No radiation safety officer is designated for large practices
	Evidence of personnel holding film during exposure
Personnel/Patient Shielding	Satisfactory lead aprons are unavailable
	Satisfactory thyroid shields are unavailable
	Satisfactory gonadal shields are unavailable
	Lead aprons are improperly stored
	Lead aprons are not checked annually for tears and holes (radiographically or visually)
	Individuals holding patients are not protected
	Mobile equipment exposure switch cord is less than 6 feet long
	Non-essential individuals are in the x-ray room during exposure

Collimation	X-ray beam is not restricted to the appropriate area X-ray beam is not restricted to the appropriate size Collimator light is not aligned with the x-ray field Collimation is not used in taking radiographs Collimator light is not bright enough under normal room lighting Collimator light problems (e.g. mirror broken, mirror obstructed) Inadequate collimation is used for clinical radiographs
Timer	Timer does not terminate exposure Timer activates at zero Timer is inaccurate Timer repeatability is unacceptable No deadman switch is available
kVp and Filtration	kVp is greater than 10% of set value kVp is non-repeatable Filtration in beam is less than required
Patient entrance skin exposure criteria (ESEC)	ESEC in milliroentgen for non-specialty radiographic examinations shall not not be exceeded when technical factors for an average adult patient are utilized:

Examination	ESEC mR maximum	ESEC mR recommended	Body part thickness (cm)
PA Chest	30	15	23
AP Cervical Spine	250	175	13
AP Thoracic Spine	900	600	23
AP Lumbar Spine	1000	675	23
AP Abdomen	750	500	23
AP Retrograde Pyelogram	900	600	23
Lateral Skull	300	200	15
Dental (bitewing or periapical)	700	350	not applicable

OR

Examination	Dose mrem maximum	Dose mrem recommended	Body part thickness (cm)
PA Chest	3.13	1.57	23
AP Cervical Spine	10.88	7.61	13
AP Thoracic Spine	93.96	62.64	23
AP Lumbar Spine	104.4	70.47	23
AP Abdomen	78.3	52.2	23
AP Retrograde Pyelogram	93.96	62.64	23
Lateral Skull	6.54	4.36	15
Dental (bitewing or periapical)	1.05	0.53	not applicable

	ESE for all x-ray units in facility are not within 20 percent of one another.
	Typical exposure value for the x-ray unit is not posted
	Exposure reproducibility is greater than 5%
Public exposure	Public exposure exceeded - 100 millirem per year
	Public is not protected from scatter radiation
Operator conditions	Operator exposure exceeded - 5000 millirem per year
	Operator cannot observe patient during exposure
	Operator cannot monitor kVp, mA, time, mAs during exposure
	Operator is not protected during exposure
	Satisfactory lead gloves are not available
	Mobile or stationary exposure switch cord is less than 6 feet long
	Exposure switch not located to prevent x-ray activation when operator is outside of of the control booth
	Operator holds film in patient's mouth
Physical condition (x-ray unit, shielding, etc.)	Console does not indicate tubes for multiple setup
	Panoramic or 3D unit does not reset before restarting
	Motion of panoramic or 3D unit is not smooth or is impeded
	X-ray tube head locks into position for panoramic, cephalometric and or 3D unit
	Table locks, tube crane locks, bucky-cassette locks are not functioning
	Filters for soft tissue imaging for cephalometric imaging are not available
	Focal spot is not indicated on the x-ray tube
	Source to image distance is less than 7 7/8 inches for intra-oral x-ray tubes
	Source to image distance is less than 40 inches for medical x-ray machines
	Unit is inaccurate/not calibrated in terms of examination distance
	Tube head is unstable
	Overhead crane does not move easily
	Exposure switch is not labeled
	Unit does not have visual indication of kVp, mA, time, or mAs
	Unit does not have audible/visual indication of exposure
	Angulation indicator on x-ray unit is not functioning
	Typical exposure for x-ray unit is not posted
	Structural shielding is inadequate
	Door interlock system is not functioning
	Condition of high voltage and other cables is inadequate
	X-ray head leaks oil
	Wires are exposed on tube head
	X-ray exposure button is missing or broken
	Wires are exposed on exposure switch
	Preventive maintenance records for x-ray machines and processor are not kept
	Bare sheet lead on walls/doors is not covered

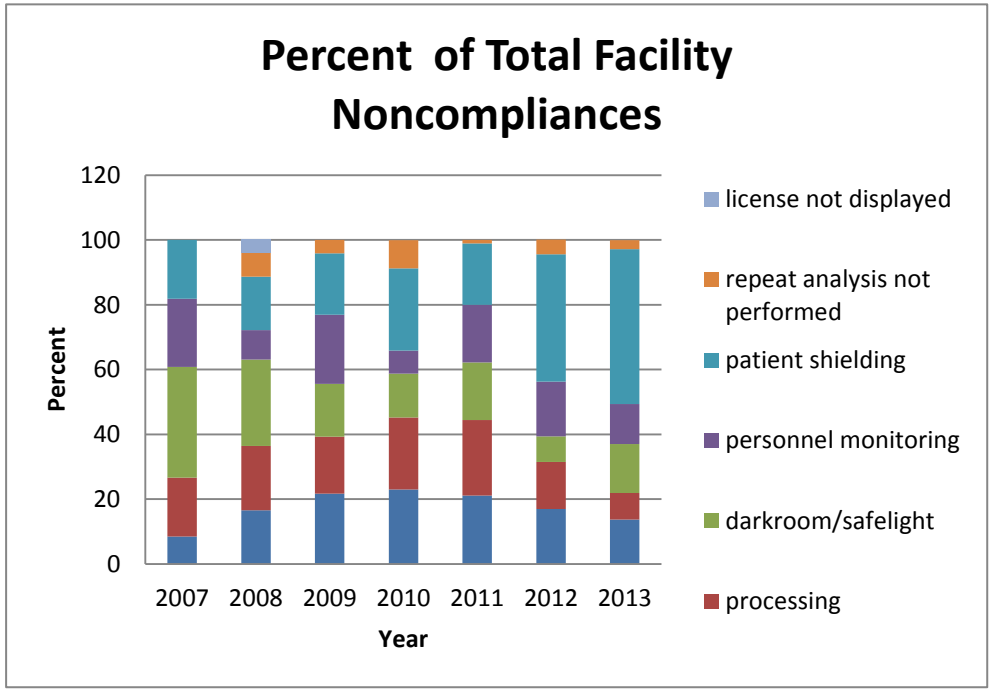
X-ray unit is not registered
Vermont State licenses are not displayed
No documentation of LMP (chiropractic)
Repeat rate analysis is not performed (chiropractic)

SUMMARY OF ALL INSPECTIONS

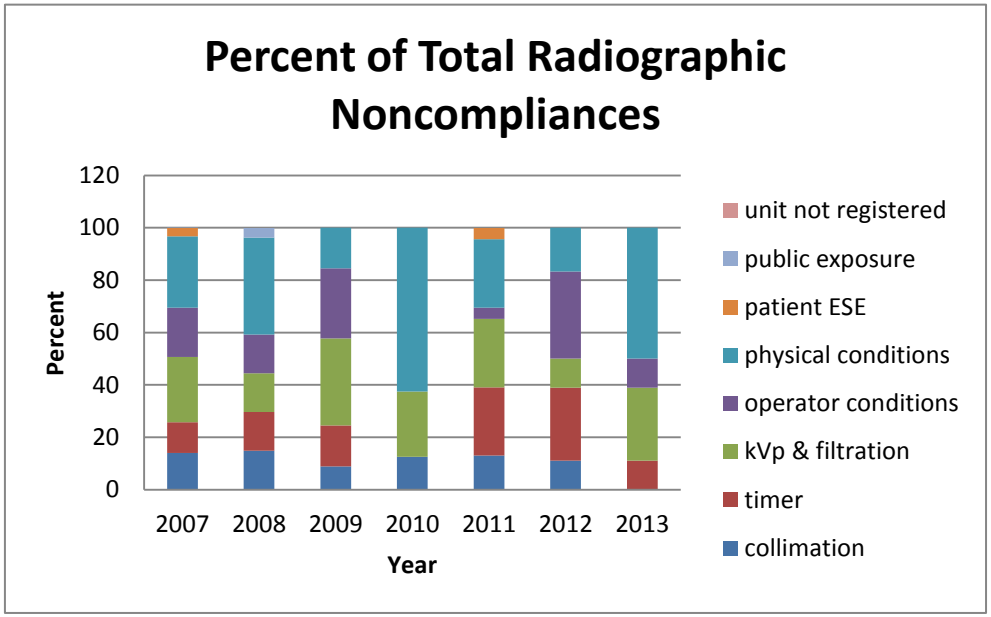
Total Number of Inspections Performed	127
Total Number of Facilities not in Compliance	56

TOTAL NONCOMPLIANCES	91
Average noncompliances per noncompliant facility	1.63
Range of number of noncompliances/facility	0 - 8

TOTAL FACILITY NONCOMPLIANCES	73	**PERCENTAGE OF TOTAL FACILITY NONCOMPLIANCES**
1 Film/Screen	10	13.7
2 Processing	6	8.2
3 Darkroom/Safelight	11	15.1
4 Personnel Monitoring	9	12.3
5 Patient Shielding	35	47.9
6 License Not Displayed	0	0.0
7 Repeat Analysis Not Performed	2	2.7



TOTAL RADIOGRAPHIC NONCOMPLIANCES	18	PERCENTAGE OF TOTAL RADIOGRAPHIC NONCOMPLIANCES
1 Collimation	0	0.0
2 Timer	2	11.1
3 kVp & Filtration	5	27.8
4 Patient entrance skin exposure	0	0.0
5 Public exposure	0	0.0
6 Operator conditions	2	11.1
7 Physical condition (x-ray unit, shielding)	9	50.0
8 Unit not registered	0	0.0



Annual Dose to Occupational Worker			
Type of Facility	Average millirem per year	Range millirem per year	Maximum Allowable millirem/yr
Dental	2.4	0.0002 - 64	5000
Medical	0.25	0.0029 - 81	5000
Chiropractic	0.027	0.004 - 0.063	5000
Podiatric	0.028	na	5000
Veterinary	0.37	0.0001 - 6.3	5000

Annual Dose to Public			
Type of Facility	Average millirem per year	Range millirem per year	Maximum Allowable millirem/yr
Dental	7.3	.0043 - 104*	100
Medical	2.9	0.026 - 53	100
Chiropractic	0.43	0.0002 - 2.1	100
Podiatric	0.13	0.0083 - 0.25	100
Veterinary	1.1	0.0012 - 33	100

*The dose to the public at this facility was measured at a distance of less than usual 6 feet due to the layout of the facility. The facility does not allow members of the public in that area during an x-ray examination.

DENTAL INSPECTIONS

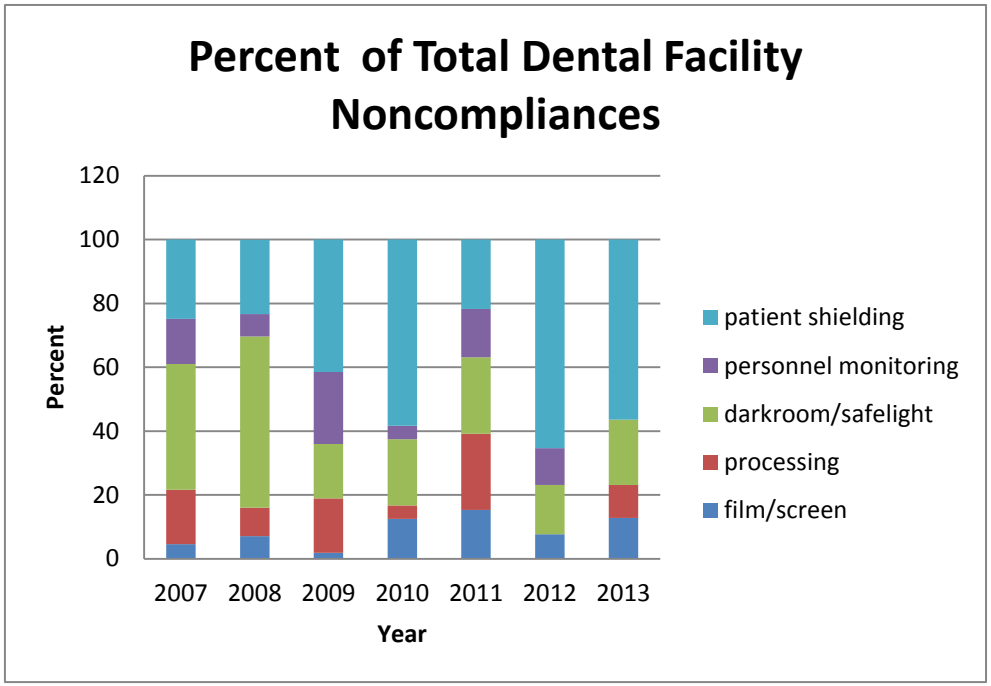
Total Number of Inspections Performed	78
Total Number of Facilities not in Compliance	34

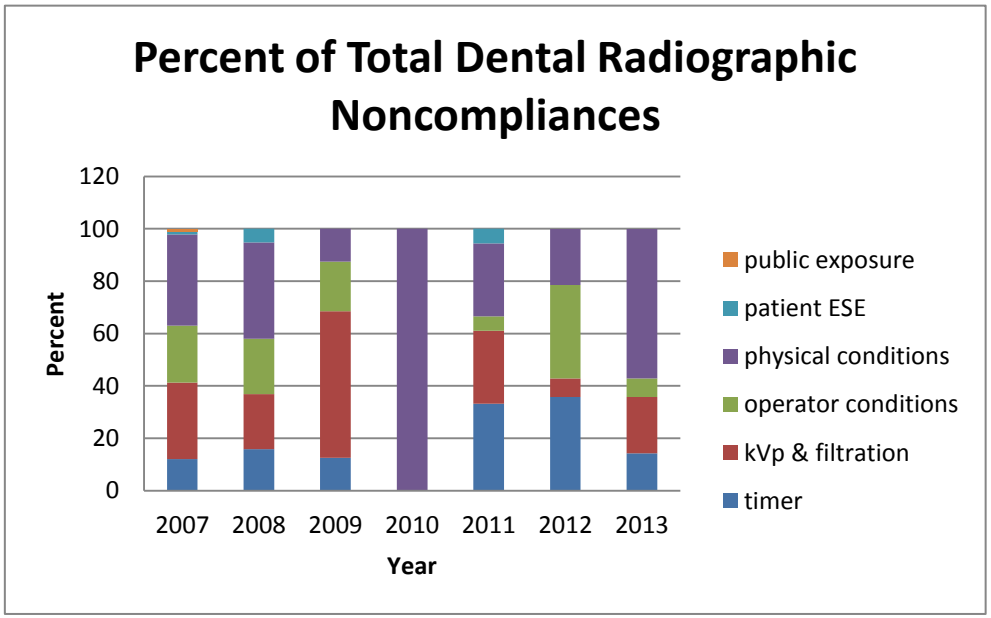
Non-compliance Items

TOTAL NONCOMPLIANCES	53
Average noncompliances per noncompliant facility	1.56
Range of number of noncompliances	0-8

TOTAL FACILITY NONCOMPLIANCES	39	**PERCENTAGE OF TOTAL FACILITY NONCOMPLIANCES**
Film/Screen	5	12.8
Processing	4	10.3
Darkroom/Safelight	8	20.5
Personnel Monitoring	0	0.0
Patient Shielding	22	56.4

TOTAL RADIOGRAPHIC NONCOMPLIANCES	14	**PERCENTAGE OF TOTAL RADIOGRAPHIC NONCOMPLIANCES**
Collimation	0	0.0
Timer	2	14.3
kVp & Filtration	3	21.4
Patient entrance skin exposure	0	0.0
Public exposure	0	0.0
Operator conditions	1	7.1
Physical condition (x-ray unit, shielding)	8	57.1
Unit not registered	0	0.0


Percent of Total Dental Facility Noncompliances
120
100
80
60
40
20
0
Percent
2007
2008
2009
2010
2011
2012
2013
Year
patient shielding
personnel monitoring
darkroom/safelight
processing
film/screen


Percent of Total Dental Radiographic Noncompliances
120
100
80
60
40
20
0
Percent
2007
2008
2009
2010
2011
2012
2013
Year
public exposure
patient ESE
physical conditions
operator conditions
kVp & filtration
timer

Dose to Patients Per Exposure

Exam Type	Average millirem per exposure	Range millirem per exposure	Vermont State maximum dose millirem	Vermont State recommended dose millirem	NCRP DRL* millirem
Intra-oral D speed film	0.47	0.27 - 0.69	1.05	0.53	0.28
Intra-oral E speed film	0.3	0.16 - 0.45	1.05	0.53	0.28
Intra-oral F speed film	0.26	0.10 - 0.58	1.05	0.53	0.28
Intra-oral Portable digital	0.07	0.04 - 0.11	1.05	0.53	0.28
Intra-oral CR digital	0.25	0.05 - 0.50	1.05	0.53	0.28
Intra-oral DR digital	0.15	0.06 - 0.54	1.05	0.53	0.28
Panoramic film	1.05	0.48 - 2.16	na**	na	na
Panoramic digital	0.86	0.14 - 1.62	na	na	na
Cephalometric	0.02	0.015 - 0.032	na	na	0.024
Cephalometric digital	na	na	na	na	0.024
Cephalometric scanner	0.33	0.20 - 0.46	na	na	0.024
3 Dimensional	0.54	0.29 - 1.35	na	na	na

* DRL = Diagnostic Reference Level (derived from NEXT data) adjusted to millirem, NCRP Report 145, 2003

** na = not applicable

Annual Dose to Occupational Worker

Exam Type	Average millirem per year	Range millirem per year	Maximum Allowable millirem/yr
Intra-oral D speed film	1.6	0.024 - 3.5	5000
Intra-oral E speed film	0.81	0.004 - 2.4	5000
Intra-oral F speed film	4.1	0.004 - 20	5000
Intra-oral Portable digital	0.27	0.10 - 0.43	5000
Intra-oral CR digital	1.6	0.011 - 7.9	5000
Intra-oral DR digital	2.1	0.001 - 41	5000
Panoramic film	0.6	0.007 - 4.1	5000
Panoramic digital	3.1	0.007 - 25	5000
Cephalometric	0.013	0.001 - 0.025	5000
Cephalometric digital	na	na	5000
Cephalometric scanner	2.5	0.32 - 4.1	5000
3 Dimensional	2.9	0.12 - 11	5000

Annual Dose to Public

Exam Type	Average millirem per year	Range millirem per year	Maximum Allowable millirem/yr
Intra-oral D speed film	16.3	0.61 - 61	100
Intra-oral E speed film	7.9	0.012 - 6.7	100
Intra-oral F speed film	11	0.10 - 55	100
Intra-oral Portable CR digital	na	na	100
Intra-oral CR digital	5	0.24 - 14	100
Intra-oral DR digital	6	0.035 - 42	100
Panoramic film	2.5	0.022 - 13	100
Panoramic digital	10	0.022 - 81	100
Cephalometric	0.06	0.004 - 0.11	100
Cephalometric digital	na	na	100
Cephalometric scanner	5.4	1.5 - 13	100
3 Dimensional	3.5	0.14 - 104*	100

*The dose to the public at this facility was measured at a distance of less than usual 6 feet due to the layout of the facility. The facility does not allow members of the public in that area during an x-ray examination.

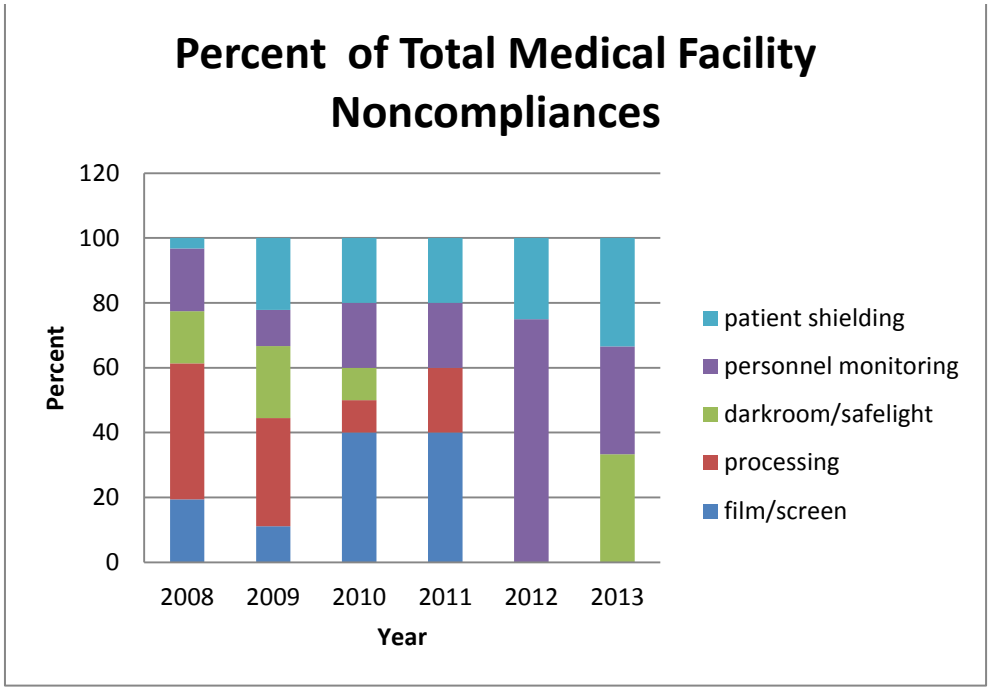
MEDICAL INSPECTIONS

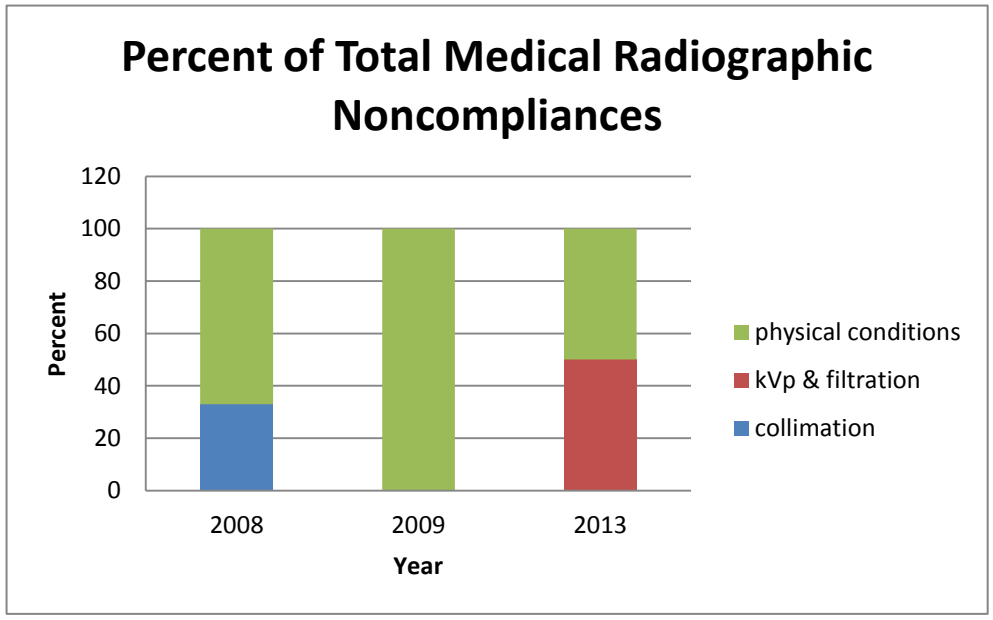
Total Number of Inspections Performed 12
Total Number of Facilities not in Compliance 4
Non-compliance Items

TOTAL NONCOMPLIANCES	5
Average noncompliances per noncompliant facility	1.25
Range of number of noncompliances	0-2

TOTAL FACILITY NONCOMPLIANCES	3	**PERCENTAGE OF TOTAL FACILITY NONCOMPLIANCES**
Film/Screen	0	0
Processing	0	0
Darkroom/Safelight	1	33.3
Personnel Monitoring	1	33.3
Patient Shielding	1	33.3

TOTAL RADIOGRAPHIC NONCOMPLIANCES	2	**PERCENTAGE OF TOTAL RADIOGRAPHIC NONCOMPLIANCES**
Collimation	0	0
Timer	0	0
kVp & Filtration	1	50
Patient entrance skin exposure	0	0
Public exposure	0	0
Operator conditions	0	0
Physical condition (x-ray unit, shielding)	1	50
Unit not registered	0	0


Percent of Total Medical Facility Noncompliances
120
100
80
60
40
20
0
Percent
2008
2009
2010
2011
2012
2013
Year
patient shielding
personnel monitoring
darkroom/safelight
processing
film/screen


Percent of Total Medical Radiographic Noncompliances
120
100
80
60
40
20
0
Percent
2008
2009
2013
Year
physical conditions
kVp & filtration
collimation

Dose to Patients Per Exposure

Type of Exam	Average millirem per exposure	Range millirem per exposure	Vermont State maximum dose millirem	Vermont State recommended dose millirem	NCRP *DRL millirem
PA Chest	1.8	0.63 - 2.7	3.13	1.57	1.8
AP Cervical Spine	4	0.96 - 7.1	10.88	7.61	na
AP Thoracic Spine	13	na	93.96	62.64	na
AP Lumbar Spine	31	20 - 98	104.4	70.47	50
AP Abdomen	na	na	78.3	52.2	41
AP Retrograde	na	na	93.96	62.64	na
Lateral Skull	2.8	na	6.54	4.36	na
Hand	0.13	0.05 - 0.25	na	na	na
Wrist	0.05	0.03 - 0.08	na	na	na
Arm	na	na	na	na	na
Shoulder	5	3.3 - 6.7	na	na	na
Leg	na	na	na	na	na
Knee	4.1	1.3 - 4.7	na	na	na
Ankle	0.21	0.17 - 0.26	na	na	na
DP Foot	0.12	na	na	na	na
Lateral Foot	na	na	na	na	na
Fluoroscopy			na	na	na
Arm	na	na	na	na	na
Knee	na	na	na	na	na
Ankle	na	na	na	na	na
AP Cervical	na	na	na	na	na
AP Lumbar	98	na	na	na	na
Fluoroscopy Spot Film	1.3	na	na	na	na
Sinus	na	na	na	na	na

* DRL = Diagnostic Reference Level (derived from NEXT data) adjusted to millirem, NCRP Report 172, 2012

Annual Dose to Occupational Worker

Average millirem per year	Range millirem per year	Maximum Allowable millirem/yr
0.25	0.003 - 81	5000

Annual Dose to Public

Average millirem per year	Range millirem per year	Maximum Allowable millirem/yr
2.9	0.026 - 53	100

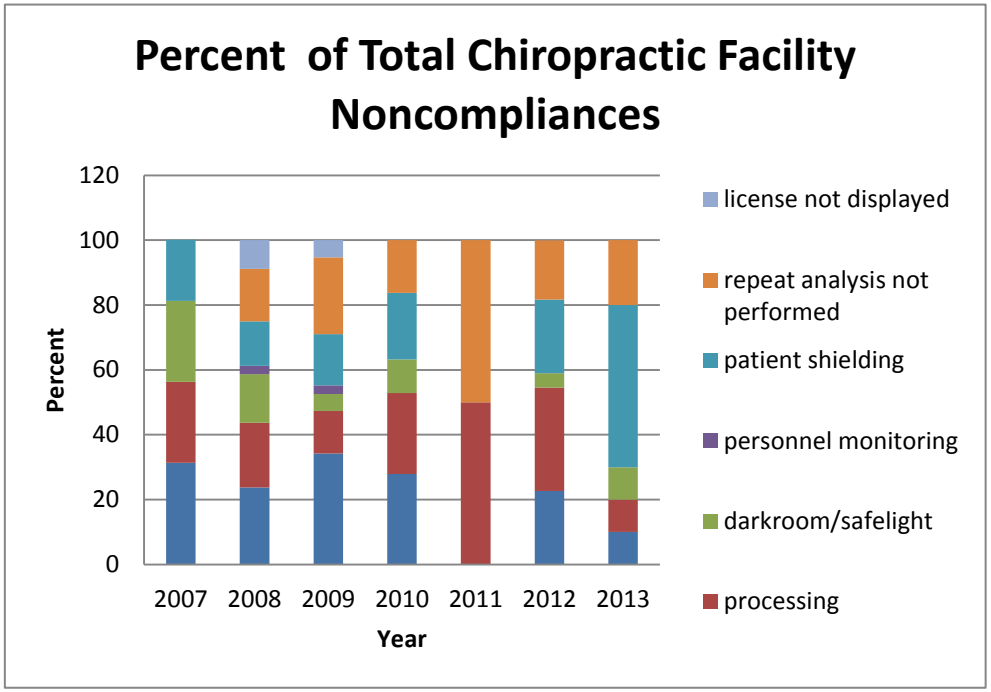
CHIROPRACTIC INSPECTIONS

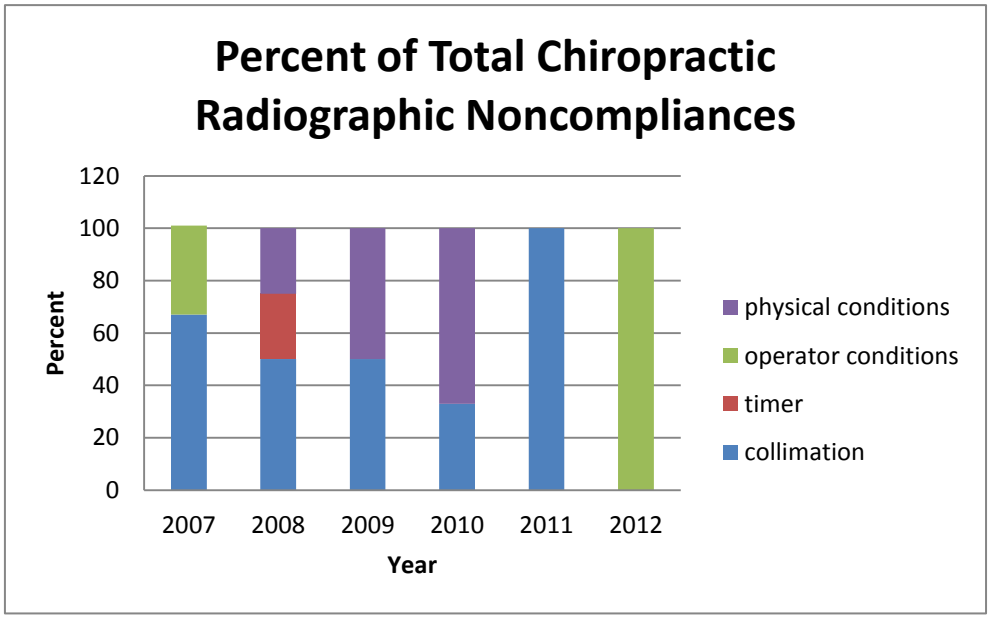
Total Number of Inspections Performed 8
Total Number of Facilities not in Compliance 3
Non-compliance Items

TOTAL NONCOMPLIANCES	10
Average noncompliances per noncompliant facility	3.33
Range of number of noncompliances	0 - 5

TOTAL FACILITY NONCOMPLIANCES	10	**PERCENTAGE OF TOTAL FACILITY NONCOMPLIANCES**
Film/Screen	1	10.0
Processing	1	10.0
Darkroom/Safelight	1	10.0
Personnel Monitoring	0	0.0
Patient Shielding	5	50.0
License Displayed	0	0.0
Repeat Analysis	2	20.0

TOTAL RADIOGRAPHIC NONCOMPLIANCES	0	**PERCENTAGE OF TOTAL RADIOGRAPHIC NONCOMPLIANCES**
Collimation	0	0.0
Timer	0	0.0
kVp & Filtration	0	0.0
Patient entrance skin exposure	0	0.0
Public exposure	0	0.0
Operator conditions	1	0.0
Physical condition (x-ray unit, shielding)	0	0.0
Unit not registered	0	0.0


Percent of Total Chiropractic Facility Noncompliances
120
100
80
60
40
20
0
Percent
2007
2008
2009
2010
2011
2012
2013
Year
license not displayed
repeat analysis not performed
patient shielding
personnel monitoring
darkroom/safelight
processing


Percent of Total Chiropractic Radiographic Noncompliances
120
100
80
60
40
20
0
Percent
2007
2008
2009
2010
2011
2012
Year
physical conditions
operator conditions
timer
collimation

Dose to Patients Per Exposure

Type of Exam	Average millirem per exposure	Range millirem per exposure	Vermont State maximum dose millirem	Vermont State recommended dose millirem	NCRP *DRL millirem
PA Chest	na	na	3.13	1.57	1.8
AP Cervical Spine	2.5	1.7 - 3.7	10.88	7.61	na
AP Thoracic Spine	26	13 - 46	93.96	62.64	na
AP Lumbar Spine	40	8.9 - 70	104.4	70.47	50
AP Abdomen	na	na	78.3	52.2	41
AP Retrograde	na	na	93.96	62.64	na
Lateral Skull	na	na	6.54	4.36	na

Type of Exam	Average millirem per exposure	Range millirem per exposure	Vermont State maximum dose millirem	Vermont State recommended dose millirem	NCRP *DRL millirem
Hand	na	na	na	na	na
Wrist	na	na	na	na	na
Arm	na	na	na	na	na
Shoulder	na	na	na	na	na
Leg	na	na	na	na	na
Knee	0.43	na	na	na	na
Ankle	0.026	na	na	na	na
DP Foot	na	na	na	na	na
Lateral Foot	na	na	na	na	na

* DRL = Diagnostic Reference Level (derived from NEXT data) adjusted to millirem, NCRP Report 172, 2012

Annual Dose to Occupational Worker

Average millirem per year	Range millirem per year	Maximum Allowable millirem/yr
0.027	0.004 - 0.063	5000

Annual Dose to Public

Average millirem per year	Range millirem per year	Maximum Allowable millirem/yr
0.43	0.0002 - 2.1	100

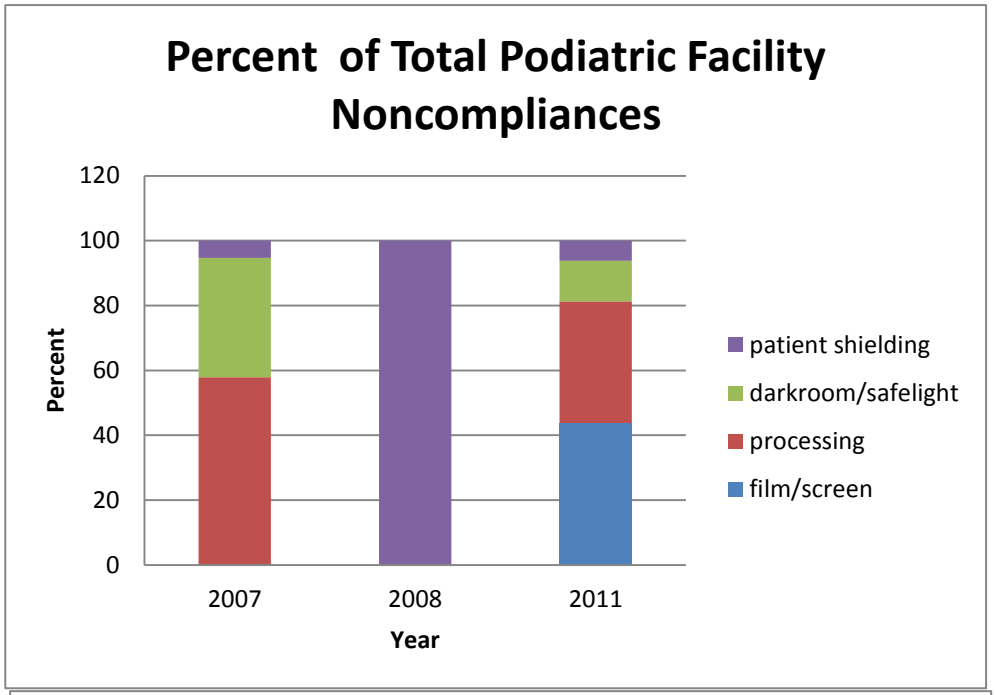
PODIATRIC INSPECTIONS

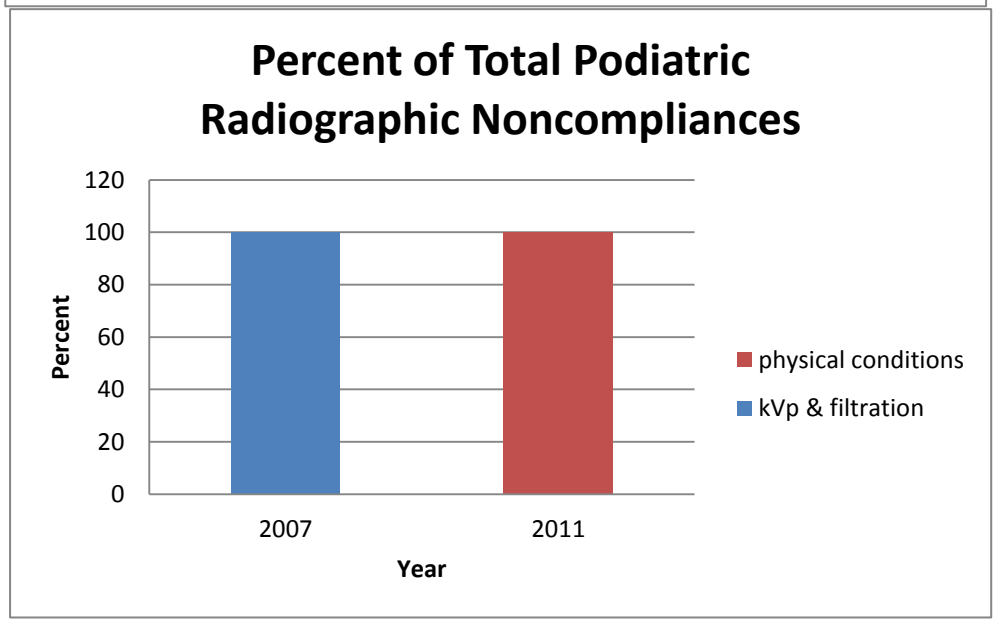
Total Number of Inspections Performed 2
Total Number of Facilities not in Compliance 0
Non-compliance Items

TOTAL NONCOMPLIANCES	0
Average number noncompliances per facility	0
Range of number of noncompliances	0

TOTAL FACILITY NONCOMPLIANCES	0	**PERCENTAGE OF TOTAL FACILITY NONCOMPLIANCES**
Film/Screen	0	0.0
Processing	0	0.0
Darkroom/Safelight	0	0.0
Personnel Monitoring	0	0.0
Patient Shielding	0	0.0

TOTAL RADIOGRAPHIC NONCOMPLIANCES	0	**PERCENTAGE OF TOTAL RADIOGRAPHIC NONCOMPLIANCES**
Collimation	0	0.0
Timer	0	0.0
kVp & Filtration	0	0.0
Patient entrance skin exposure	0	0.0
Public exposure	0	0.0
Operator conditions	0	0.0
Physical condition (x-ray unit, shielding)	0	0.0
Unit not registered	0	0.0


Percent of Total Podiatric Facility Noncompliances
120
100
80
60
40
20
0
Percent
2007
2008
2011
Year
patient shielding
darkroom/safelight
processing
film/screen


Percent of Total Podiatric Radiographic Noncompliances
120
100
80
60
40
20
0
Percent
2007
2011
Year
physical conditions
kVp & filtration

Dose to Patients Per Exposure

Type of Exam	Average millirem per exposure	Range millirem per exposure	Vermont State maximum dose millirem	Vermont State recommended dose millirem	NCRP *DRL millirem
DP Foot	0.14	na	na	na	na
Lateral Foot	0.24	0.16 - 0.31	na	na	na

Annual Dose to Occupational Worker

Average millirem per year	Range millirem per year	Maximum Allowable millirem/yr
0.028	na	5000

Annual Dose to Public

Average millirem per year	Range millirem per year	Maximum Allowable millirem/yr
0.13	0.008 - 0.25	100

VETERINARIAN INSPECTIONS

Total Number of Inspections Performed 26

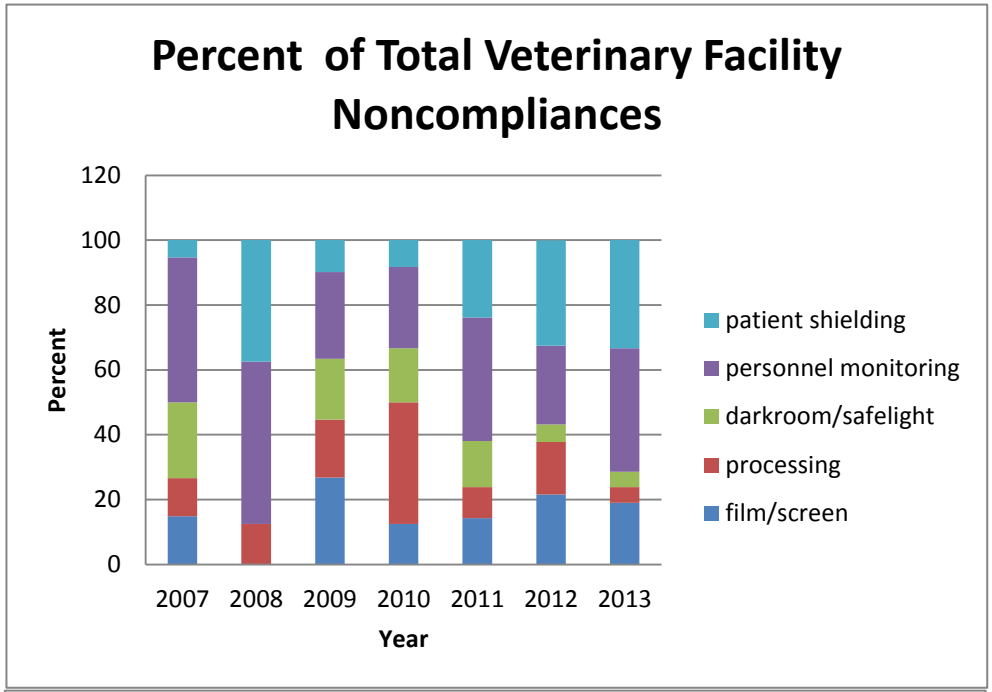
Total Number of Facilities not in Compliance 15

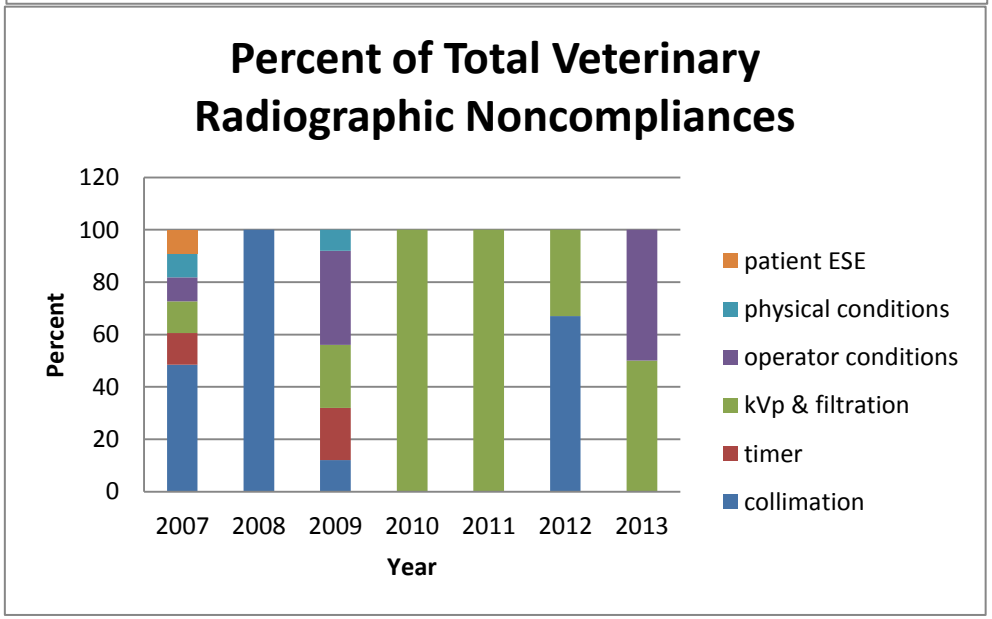
Non-compliance Items

TOTAL NONCOMPLIANCES	23
Average number noncompliances per facility	1.53
Range of number of noncompliances	0 - 3

TOTAL FACILITY NONCOMPLIANCES	21	**PERCENTAGE OF TOTAL FACILITY NONCOMPLIANCES**
Film/Screen	4	19.0
Processing	1	4.8
Darkroom/Safelight	1	4.8
Personnel Monitoring	8	38.1
Patient Shielding	7	33.3

TOTAL RADIOGRAPHIC NONCOMPLIANCES	2	**PERCENTAGE OF TOTAL RADIOGRAPHIC NONCOMPLIANCES**
Collimation	0	0
Timer	0	0
kVp & Filtration	1	50
Patient entrance skin exposure	0	0
Public exposure	0	0
Operator conditions	1	50
Physical condition (x-ray unit, shielding)	0	0
Unit not registered	0	0


Percent of Total Veterinary Facility Noncompliances
120
100
80
60
40
20
0
Percent
2007
2008
2009
2010
2011
2012
2013
Year
patient shielding
personnel monitoring
darkroom/safelight
processing
film/screen


Percent of Total Veterinary Radiographic Noncompliances
120
100
80
60
40
20
0
Percent
2007
2008
2009
2010
2011
2012
2013
Year
patient ESE
physical conditions
operator conditions
kVp & filtration
timer
collimation

Exposure to Animals Per Exam

Type of Exam	Average milliroentgen per exposure	Range milliroentgen per exposure
Dog chest	31	11 - 145
Dog abdomen	46	10 - 124
Dog extremity	7.3	1.2 - 23
Dog dental	127	91 - 192
Cat-o-gram	11	2.8 - 48
Cat chest/abdomen	8	7.7 - 8.6
Cat extremity	7.4	2.4 - 14
Cat dental	71	50 - 89
Horse hoof	23	6.9 - 153
Horse navicular	25	9.6 - 153
Horse fetlock/pastern/ankle	23	9.6 - 153
Horse carpus/knee	25	9.6 - 153
Horse hock	27	9.6 - 153
Horse gaskin/forearm	26	9.6 - 153
Horse canon	27	9.6 - 153
Horse stifle/hip	49	21 - 153
Horse spine	28	21 - 153

Annual Dose to Occupational Worker

STATIONARY X-RAY Position of Operator	Average millirem per year	Range millirem per year	Maximum Allowable millirem/yr
Operator exposure at edge of table	11	0.21 - 45	5000
Operator exposure at opposite ends of table	6.2	0.55 - 28	5000
Operator exposure 3 feet from x-ray unit	3.3	0.10 - 11	5000
Operator exposure 6 feet from x-ray unit	0.93	0.025 - 3.8	5000
Operator exposure behind shield, wall, or door	0.42	0.003 - 6.3	5000
Extremity exposure	36	0.54 - 163	50,000

PORTABLE X-RAY Position of Operator	Average millirem per year	Range millirem per year	Maximum Allowable millirem/yr
Operator exposure holding unit	7.7	0.029 - 43	5000
Operator exposure 3 feet from x-ray unit	3.9	0.027 - 41	5000
Operator exposure 6 feet from x-ray unit	0.39	0.01 - 2.1	5000
Operator exposure 9 feet from x-ray unit	na	na	5000
Operator exposure at end of exposure cord	na	na	5000
Operator exposure behind shield, wall, or door	na	na	5000
Extremity exposure	9.1	0.4 - 55	50,000

DENTAL X-RAY Position of Operator	Average millirem per year	Range millirem per year	Maximum Allowable millirem/yr
Operator exposure at edge of table	0.76	0.019 - 1.4	5000
Operator exposure 6 feet from x-ray unit	0.06	0.021 - 0.11	5000
Operator exposure at end of exposure cord	na	na	5000
Operator exposure behind shield, wall, or door	0.008	0.0001 - 0.021	5000
Extremity exposure	2.9	0.033 - 5.8	50,000

Annual Dose to Public

	Average millirem per year	Range millirem per year	Maximum Allowable millirem/yr
Stationary X-Ray	0.22	0.0012 - 1.3	100
Portable X-Ray	2.1	0.0017 - 0.42	100
Dental X-Ray	6.6	0.0003 - 33	100