

Appendix 4 – Compliance Verification Checklist for Dental X-ray Equipment

In accordance with Safety Code 30: "Radiation Protection in Dentistry:
Recommended Safety Procedures for the Use of Dental X-ray Equipment"
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Item No.	Compliance Item Description	Safety Code Section	Yes	No	N/A
	Responsibility and Personnel	3.			
1	Responsible User: Dentist, registered dental hygienist or registered dental assistant <ul style="list-style-type: none"> - Ensure that the installation complies with all applicable regulatory requirements, including equipment registration - Establish safe working conditions - Ensure that radiation shielding is adequate - Ensure that equipment functions properly and is operated correctly - Ensure that maintenance is performed by competent personnel - Ensure that operators are properly trained - Ensure that operators-in-training work only under the direct supervision of a qualified operator - Implement and maintain a Quality Assurance program for the facility 	3.1			
2	Equipment Operator <ul style="list-style-type: none"> - Recognize radiation hazards - Have a thorough understanding of safe working methods and appropriate techniques and procedures - Participate fully in the Quality Assurance program 	3.2			
	Equipment Requirements – General	5.2.1			
3	An X-ray control panel that is equipped with: <ol style="list-style-type: none"> 1. Warning Signs: a permanent and conspicuous sign prohibiting unauthorized use and warning that hazardous X-radiation is emitted when the equipment is in operation 2. Status indicators -readily discernible indicators on the control panel that indicate: when the control panel is energized and when X-rays are produced 	5.2.1.1 5.2.1.2			
4	When more than one X-ray tube is controlled by one control panel, there must be readily discernible indicators, at or near each X-ray tube housing and on the control panel, showing which tube is connected and ready to be energized. There should be an interlock preventing the energizing of more than one X-ray tube at the same time.	5.2.1.2			

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5	<p>Indication of Loading Factors:</p> <ol style="list-style-type: none"> 1. For X-ray equipment having adjustable loading factors, the control panel <i>must</i> incorporate indicators that allow these loading factors to be determined. 2. For equipment having non-adjustable loading factors, permanent marks or labels may be used to indicate these parameters. 	5.2.1.3			
6	<p>Irradiation Control:</p> <ol style="list-style-type: none"> 1. There must be an irradiation switch to initiate and terminate X-ray production 2. This switch must be of a type that requires continuous pressure to produce X-rays 3. Where the irradiation switch is a footswitch it must be so constructed that operation of the X-ray tube cannot occur inadvertently should the footswitch be overturned 4. Where the irradiation switch is mounted at the end of a cable, the cable must be of sufficient length to enable the operator to stand at least 3 metres from the tube housing and the patient 5. If the switch is in a fixed location, it must be at least 3 metres from the tube housing. 	5.2.1.4			
7	<p>Controlling timer:</p> <ol style="list-style-type: none"> 1. An electronic timing device must be provided to automatically terminate the irradiation. Mechanical timers must not be used. 2. The timer must be designed and constructed in such a way that: <ol style="list-style-type: none"> i. it is not possible to energize the X-ray tube without automatic or manual resetting of the timer after each loading ii. irradiation cannot be started with the timer set at its zero or OFF position; and iii. the production of X-rays is automatically terminated after a preset time, milliampere-second value, or exposure value. 	5.2.1.5			
8	<p>Filtration:</p> <p>For a given kilovoltage, the measured value of half- value layer of aluminum <i>must</i> follow the limits below:</p> <ul style="list-style-type: none"> 1.5 mm Al at 50 kVp 1.5 mm Al at 60 kVp 1.5 mm Al at 70 kVp 2.1 mm Al at 71 kVp 2.3 mm Al at 80 kVp 2.5 mm Al at 90 kVp 2.7 mm Al at 100 kVp 	5.2.1.6			

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9	Mechanical Stability: <ol style="list-style-type: none"> 1. The X-ray tube <i>must</i> be securely fixed and correctly aligned within the X-ray tube housing. 2. The X-ray source assembly <i>must</i> maintain its required position without excessive drift or vibration during operation. 	5.2.1.7			
10	Irradiation Reproducibility: For any selected combination of X-ray tube voltage, current and time, the coefficient of variation of any 10 consecutive irradiations taken at the same distance within a period of 1 hour is not greater than 0.05.	5.2.1.8			
11	X-Ray Tube Voltage Accuracy: The actual peak X-ray tube voltage should not deviate from the indicated or selected value by more than 7%, or by the value specified by the manufacturer. It must not be possible to set or operate the X-ray tube with the tube voltage below 50 kilovolts (peak).	5.2.1.9			
12	X-ray Tube Current: The actual X-ray tube current should not deviate from the indicated or selected value by more than 5%, or by the value specified by the manufacturer, and be temperature compensated for normal operating conditions.	5.2.1.10			
13	X-Ray Tube Shielding: <ol style="list-style-type: none"> 1. The X-ray tube <i>must</i> be enclosed in a shielded housing. 2. The leakage radiation from the X-ray tube housing <i>must not</i> exceed 0.873 mGy (100 mR) in 1 hour at 1 metre at the nominal X-ray tube voltage on the equipment 	5.2.1.12			
14	Linearity: For any selected X-ray tube voltage and for any irradiation time greater than 1/20 second, the following relation must hold: $X_1 - X_2 < 0.1 (X_1 + X_2)$ where X_1 and X_2 are the average values of exposure per second, per pulse or per milliamper-second obtained: <ol style="list-style-type: none"> i. where the X-ray tube current is fixed, at each two settings of ii. irradiation timer not differing by more than a factor of two, or iii. where the irradiation time is fixed, at each two X-ray tube current settings not differing by more than a factor of two. 	5.2.1.11			
	Equipment Requirements – Intraoral	5.2.2			
15	Applicator: A position-indicating device must be provided to limit the minimum focal spot to skin distance to not less than 18 centimetres. The applicator must be an open-ended type. Pointed cone or close-ended applicators must not be used.	5.2.2.1			

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16	Beam Limiting Device: The primary radiation beam must be collimated in size at the end of the applicator to a circle not more than 7 centimetres in diameter, or a rectangle of area not more than 38.5 cm ² .	5.2.2.2			
17	Controlling Timer: The maximum presettable irradiation time must not exceed 5 seconds, or the time required to deliver 50 milliamperes-seconds, whichever is shorter	5.2.2.3			
	Equipment Requirements – Panoramic	5.2.3			
18	Applicator: A position-indicating device must be provided to limit the minimum focal spot to skin distance to not less than 15 centimetres.	5.2.3.1			
19	Beam Limiting Device: The primary radiation beam must be collimated such that the size of the radiation beam at the image receptor does not exceed any dimension of the scanning slit by more than one-half of that dimension or by more than 2% of the focal spot to image receptor distance, whichever is less.	5.2.3.2			
20	Cassette Carrier: The cassette carrier should be interlocked such that irradiation is not possible, unless a film cassette is in the cassette carrier.	5.2.3.3			
21	Controlling Timer: The maximum presettable irradiation time must not exceed 25 seconds, or the time required to deliver 250 milliamperes-seconds, whichever is shorter	5.2.2.4			
	Film Processing and Handling	6.			
22	Manufacturers' recommendations about the strengths and temperatures of the solutions and immersion times <i>must</i> be followed to ensure optimum film processing	6.1.1			
23	Developing solutions must be monitored and replenished or changed as necessary and according to the manufacturers' recommendations.	6.1.2 & 6.1.3			
24	Manufacturers' recommendations about the operation and servicing of automatic film processors <i>must</i> be followed to ensure optimum film processing	6.1.5			
25	The darkroom must be clean of dirt, dust, and spilled chemical residues.	7.4.2			
26	The darkroom <i>must</i> be light-tight and must be designed to incorporate a lockable door, double doors or a blackened maze entrance	6.2.1 & 6.2.2			
27	A warning light or sign should be located outside the darkroom to indicate when the room is in use	6.2.3			

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28	Safelights, fitted with light bulbs of correct intensity, and filters appropriate to the specifications of the film used <i>must</i> be positioned at the proper distances from work areas within the darkroom.	6.2.4			
29	<ul style="list-style-type: none"> - Film storage container must be adequately shielded to ensure that excessive irradiation of film by X-rays does not occur. - Storage should be provided so that no film receives more than 1.75 μGy (0.2 mR) of stray radiation before use. - Films should be stored on end in a cool, dry area. 	6.3			
30	<ul style="list-style-type: none"> - The condition of viewboxes should be checked regularly. - Fluorescent tubes should be changed when signs of aging develop - The viewing surface should be cleaned carefully 	6.4			
31	<p>Cassettes and Screens (panoramic equipment)</p> <ul style="list-style-type: none"> - Cassettes should therefore be checked regularly for wear and cleanliness. - Screen cleaners recommended by manufacturers should be used. - Films should never be left inside cassettes with screens for any extended period of time. 	6.5			
	Quality Assurance Program	7.			
32	Quality Assurance Program must meet minimum standards set by the Alberta Dental Association and College	7.1			
	Radiation Protection	8.			
33	<p>Adequate Shielding:</p> <ol style="list-style-type: none"> 1. 20 mSv for radiation workers 2. 1 mSv for members of the public 	4.1			
34	The operator is not exposed to the primary radiation beam and can keep a distance of at least 3 metres from the X-ray tube when operating the irradiation switch. If this is not possible, an adequately shielded barrier, which allows observation of the patient, must be provided for the operator to stand behind during radiography	4.2.1			
35	The primary radiation beam and scattered radiation are absorbed as close as possible to the source	4.2.4			
36	The primary radiation beam is always directed towards a shielded or unoccupied area.	4.2.5			
37	All personnel <i>must</i> fully use all protective devices available.	8.1.4			
38	All operators of X-ray equipment, together with personnel who routinely participate in radiological procedures must wear personnel dosimeters under the protective clothing.	8.1.9 & 8.1.10			
39	The dental film should be fixed in position with a holding device, whenever possible, otherwise it should be held by the patient. Personnel must not hold the film or the X-ray tube housing in place during operation.	8.1.6 & 8.1.8			

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40	Dental radiography must not be carried out at X-ray tube voltages below 50 kilovolts (peak) and should not be carried out at X-ray tube voltages below 60 kilovolts (peak).	9.2.4			
41	The patient must be provided with a shielded apron, for gonad protection, and a thyroid shield, especially during occlusal radiographic examinations of the maxilla. In panoramic radiography, dual (front and back) lead aprons should be worn.	9.2.7			
43	Dental X-ray equipment must have a regular preventative maintenance program and should be calibrated on a regular basis.	9.2.5			