The importance of X-ray film development quality control (for both manual and automatic processing) has become more evident over the last decade, and therefore many states such as Washington are requiring x-ray facilities to perform Quality Assurance (QA) tests on a periodic basis. Such monitoring of film development performance can assist all facilities in:

1. consistently producing optimal diagnostic images, while
2. reducing unnecessary radiation exposure.

This guide sheet provides information on setting up a dental film development quality control program and provides 3 methods of doing so. Note that we are not requiring QA for digital imaging except to use those procedures recommended by the digital detector’s manufacturer. Following manufacturer guidelines is sufficient for digital systems.

**Why is it important to perform QA for x-ray film processing?** Processing quality control ensures that film development is satisfactorily on a daily basis. This is vital for optimal diagnostic quality (contrast and density), reduced exposure to patients, and a minimum of repeat examinations. Offices performing automatic and manual film processing need to use the correct chemicals and the proper operating temperature for film processing to obtain quality radiographs. QA tests highlight and detect subtle changes which, undetected and uncorrected, could result in misdiagnosis due to poor quality, or repeat examinations resulting in unnecessary dose and increased costs. Time, temperature, and chemical activity are the three processing variables that can affect film quality. Paying attention to these variables brings you benefits of increased quality patient care and diagnosis.

The following are the methods you can choose from in order to comply with the requirement for QA of dental film processing:
Method 1
Dental Radiographic Normalizing and Monitoring Device

This is a commercial “slide rule” device using a Kodak pre-processed film strip and a small copper square under which you put a dental intra-oral film and expose. You compare your film with one of the film strip densities to determine how well your film development is doing. This tool or device is called the Dental Radiographic Normalizing and Monitoring Device, or Dental Radiographic Quality Control Device.

Cost: approximately $25 or $20, depending on how many you purchase, which vendor, etc. Contact your dental supplier or call 970-470-0859, the manufacturer in Colorado (website www.xrayqc.com).

You will need a box of your dental intra-oral film.
1. **Establishing your reference film.** The first time the procedure is performed, use new, fresh processing solutions for developing films, and ensure that it is of the proper kind (rollerless or roller-type for automatic). Ensure the temperature of the developer chemistry is set at that reading recommended by the chemical or processor manufacturer. This is vitally important, because you want to start out with the best possible processing conditions.
2. Place device on a flat surface. Insert unexposed intraoral film under copper square.
3. Position the cone, centered on copper square and touching the device.
4. Expose the test film using typical posterior bitewing technique factors.
5. Process the test film.
6. Insert dried test film into the film slot on the test tool.
7. Slide film strip until one of the density steps matches the test film density.
8. If the test film is above or below the mid-density steps (3–5), adjust the x-ray timer settings and repeat Steps 1–7.
9. Record on a logsheet the technique factors used and the density setting matched by the film.

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Record Sheet of Periodic Monitoring*

Radiographic System ID: X-ray machine ____________________________________ Make and Model
Processing: Hand-tank ____________
Automatic: ___________________ Make and Model
Film Speed: D ____ E ____ F____
Exposure factors: Optimize for bite wing radiograph:
Kvp ______ mA ______ Timer Settings ______
Acceptable density step recorded: 3 4 5 (density range) (circle one)

<table>
<thead>
<tr>
<th>Date: Test film exposed</th>
<th>Density match on Device: step number</th>
<th>Density step number acceptable: Yes/No</th>
<th>If No, refer to Trouble Shooting Guide**</th>
<th>Comments</th>
<th>Changed Processing solutions - Date</th>
<th>Cleaned tanks or processor - Date</th>
</tr>
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</table>

*Make copies of sheet or print from our web site www.xrayqc.com follow links to Record Sheet.
Also, use separate Sheet for each xray system.
** Identify problem, correct and verify through monitoring procedure.
10. Using the techniques established in Step 9, repeat test weekly and record results on the logsheet. The results of each weekly test should be within one step of the first test film obtained following procedure Steps 1–9. If the results are off by more than one step, refer to troubleshooting guide on the device. If problems persist after troubleshooting, contact your dental supplier.

Details and further information: The Dental Radiographic Normalizing and Monitoring Device, developed by the Food and Drug Administration (FDA), and now a commercial product, provides a simple and effective test tool for monitoring intraoral processing system performance in dental offices of all sizes. This is not an endorsement of this particular product. It is a description of a product that is currently available and provides a benefit to dental offices.

Method 2
Dental Film Processing Constancy Test

This is an easy way to assure that the X-ray film processing is providing you optimal and consistent radiographs without expensive equipment. The procedure is easy and also has the benefit of running a check on the other parts of the imaging chain, such as the X-ray machine output itself.

1. Obtain a small aluminum step wedge through your dental supplier, or create a similar object.
2. Ensure you have fresh chemistry in your processor or hand tanks, and that it is of the proper kind (rollerless or roller–type for automatic). Also ensure that it is at the proper temperature specified by the chemistry manufacturer and/or the processor manufacturer.
3. Select the longest processing time on the processor, if that is selectable on your model (you should use the longest selectable time for the best possible image quality). If you are using manual processing, use 5 minutes development at 68 degrees. If you are using rapid developer for endodontics, follow the instructions.
4. Place one of your dental intraoral films underneath the step wedge, place the tip of the x-ray tubehead cone above it and in contact with it, select your normal bitewing or periapical timer setting on the X-ray machine and expose.
5. Develop the film and retain it as your “reference” QA film.
6. Weekly, and after any service on the equipment (processor or X-ray machine), perform this test EXACTLY as you did it for the reference film, and compare the resultant film against your reference film on a viewbox, side by side, evaluating both density and contrast with your eye.

7. Log the results (“OK” or “light”) on a chart or logsheet. If “light” then your goal is to take action to correct the problem, whatever you find it to be (i.e., old chemistry, low developer temperature, broken processor thermostat or heater, bad film, bad chemistry, etc). Make the changes or corrections and document them on that chart or logsheet. The following is a sample:

<table>
<thead>
<tr>
<th>Date of test film</th>
<th>Acceptable Y or N</th>
<th>Action taken</th>
</tr>
</thead>
<tbody>
<tr>
<td>4/5/2010</td>
<td>yes</td>
<td>----</td>
</tr>
<tr>
<td>4/12/2010</td>
<td>no</td>
<td>Temperature increased to 82</td>
</tr>
</tbody>
</table>

**Method 3**

**Use of a Sensitometer and Densitometer**

Cost: approximately $500-$1000 each, depending on manufacturer, model and vendor. Contact your dental supplier.
Special note:
It is difficult to use a sensitometer to flash your film when you have no darkroom, and instead have a daylight loader (e.g., “glovebox”) attached to your X-ray film processor. If you do not have a darkroom, we advise you to use Methods 1 or 2 instead, above.

Please call us at 1-800-299-XRAY (9729) for questions. The X-ray inspector assigned to your area will be happy to visit your office and answer any questions.