Q.A. Collectible

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

Darkroom Fog

Although the effect of fog on an x-ray film is usually subtle, it can degrade the image quality to such an extent that the examination must be repeated. Fogging may be due to many factors, including improper film storage conditions, accidental exposure to ionizing radiation, improper processing, or using film kept past its expiration date. The most common source of fog is poor darkroom lighting conditions.

MEASUREMENT PROTOCOL:*

1. Load a cassette using film from a fresh box of film. Fog testing should be done with each type of film used by the facility.

2. Center the cassette on an x-ray table at an SID of 40" (100 cm). Place an aluminum step wedge in the center of the cassette, aligning the long dimension of the wedge with the long axis of the cassette. Collimate the light field to the edges of the step wedge.

3. Using technique factors of approximately 70 kVp and 5 mAs, make an exposure of the step wedge. Ideally, the image of the step wedge on the film will have a density on the middle step of around 1.0 OD units.

4. In the darkroom, remove the film from the cassette and position the film on the work area to be tested. Using an opaque material such as cardboard, bisect the latent image of the step wedge.

5. Expose the film to normal safelight conditions for two minutes then process the film.

*NOTE: This protocol only deals with dual emulsion films. Single emulsion films also present similar problems. Testing for fog for this type of film usually requires the use of a photographic sensitometer for the exposure.

EVALUATING THE FILM:

Visually inspect the processed film. Be aware that the human eye can observe differences of 0.01 OD if there is a defined line or break between two densities. If there is no defined line between the two halves of the step wedge image, then there is no fogging problem.

If one half of the film shows an increased density AND there is a discernible line or edge through the image, then the amount of this difference must be determined. Using a densitometer, measure the optical density on each side of all steps to determine the maximum difference. The difference between the two sides is a measure of the darkroom fog. Since the difference in density

measurements will vary for each step, the step with the maximum density difference must be found.

Record the maximum density difference measured for the step wedge, and the step on which it was measured.

RATIONALE:

Fog levels should be less than 0.05 density units. Levels in excess of this value can usually be reduced with minimal effort, such as re-adjusting the position of the safelight, replacing the safelight filter, or checking to see that the proper wattage bulb has been installed into the safelight.

If the fog levels are greater than 0.05 density units, the test should be repeated with the safelights turned off. This will help to identify the source of the fogging. If the fog disappears, then the problem was caused by the safelights. If the fogging remains constant, then the problem possibly is being caused by a light leak into the darkroom. Darkroom fog can also be caused by indicator lights on processors, other electronic equipment, luminous dials on clock, etc. In addition, many darkrooms have ceilings made of perforated tile. This ceiling type can allow light to leak into the darkroom from the surrounding areas. If the fog levels have been reduced but are still significant, then the cause may be due to a combination of problems.

SUGGESTED MEASUREMENT FREQUENCY:

Semi-annually, or more frequently if problems are discovered. Also, when the darkroom light bulb or filter is changed.

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