**MILLIAMPERE-SECONDS**

**Laboratory Experiment #1**

**PART A**

**Procedure:**

Using a step-wedge penetrometer, make a series of four exposures, using the techniques listed below, tabletop with a 14 x 17 inch 400-speed screen cassette. Use the same focal spot size for all exposures. The exposure times suggested may have to be adjusted for equipment. Use a new section of film each time, and number your exposures with lead markers.

Fixed = 50 kVp

Exposure #1: 1/40 (0.024) sec., 100 mA

Exposure #2: 1/20 (0.05) sec., 100 mA

Exposure #3: 1/10 (0.1) sec., 100 mA

Alternate Techniques

Fixed kVp = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Exposure #1: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Exposure #2: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Exposure #3: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Analysis:**

1. Select a very light gray step of the penetrometer image in Exposure #1 and circle the same step on each exposure. Measure the radiographic density in the selected area for each radiograph with a densitometer. Record these values. Calculate the density change ratios (∆D), by dividing the smaller number into the larger number for each pair of exposures (1 vs. 2, 2 vs. 3), and record.
2. Note the density change ratios obtained in #1. When exposure time or mA is doubled, how much does the radiographic density change on the average?
3. Are these density changes within plus or minus 25 percent of what they should be? If not, what things could cause the inaccuracy?
4. Pick two exposures with medium densities and measure on the densitometer the density two steps down from the step you measured on the step-wedge penetrometer in Question #1. Calculate the contrast of each film by dividing the smaller step density into the larger and record.
5. Compare the contrast levels measured in #4. Do changes in exposure time or mA have a significant (more than 0.3) effect on radiographic contrast?

**PART B**

**Procedure:**

Using a step-wedge penetrometer, make a series of three exposures using different mA and exposure times which produce the same total mAs, as listed below, tabletop with an 11 x 14 inch 400-speed screen cassette. Use the same focal spot size for all exposures. Use a different section of film each time, and number your exposures with lead markers.

Fixed = 50 kVp

Exposure #1: 50 mA at 1/10 (0.1) sec. = 5 mAs

Exposure #2: 100 mA at 1/20 (0.05) sec. = 5 mAs

Exposure #3: 200 mA at 1/40 (0.025) sec. = 5 mAs

Alternate techniques:

Fixed kVp = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Exposure #1: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Exposure #2: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Exposure #3: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Analysis:**

The mAs/density relationship can be examined and evaluated by measuring the radiographic densities of the penetrometer with the aid of a densitometer.

1. Select a medium-gray step of the penetrometer image and measure the radiographic density on the same step for each exposure with a densitometer. Record these values. Calculate the density change ratios (∆D), by dividing the smaller number into the larger for each pair of films (1 vs. 2, 2 vs., 3), and record.
2. As long as the total mAs remains the same, should the particular mA and time combination used affect radiographic density?
3. Should the total mAs be directly proportional to radiographic density?
4. Note the density change ratios obtained in #1. On the average, was density maintained *within 25 percent* by maintaining total mAs in this experiment?
5. Give an example of why it is important to be able to manipulate different mA and exposure time while maintaining total mAs.