EFFICIENT DARKROOM
Pertaining to cleanliness
Uncluttered counter tops

6.) LIGHT-TIGHT ENTRANCE
SINGLE DOOR DARKROOM
The simplest type
Need to provide a passbox
RATIONALE: avoid RT in entering the darkroom

LIGHT-LOCK DOOR/DOUBLE DOOR DARKROOM
Used only when there is darkroom personnel exclusive in the darkroom
If door 1 is open, door 2 is closed

LABYRINTH/MAZE
Zigzag type
Used only when the darkroom is large
RATIONALE: it requires more space
REVOLVING DOOR
The fast access type
RATIONALE: can enter and exit at the same time

PASSBOX/FILM CASSETTE TRANSFER CABINET
Allows the film to transfer without entering the darkroom
Has an interlocking/alarm

7.) ILLUMINATION
WHITE LIGHT ILLUMINATION
Overhead light
2-4 fluorescent lamps
48 inches/8 m2
PURPOSE:
Maintenance
Emergency cases
Cleaning

SAFELIGHT ILLUMINATION
DISTANCE: 3-4 ft
WATTAGE:
7.5 watts (3 ft distance)
15 watts (4 ft distance)
FILTERS:
Filters out intensity (strength) and energy (color)

AMBER FILTER
Filters out Red, Orange and Yellow colors

F.) FIXER SOLUTION
- Quarterly/Every 3 months/Weekly
- NORMAL pH: 4-4.5 or 4.2-4.9
- ACIDIFIER: Acetic acid and Sulfuric acid

- pH RANGE
  - 7-14: alkaline, base chemical
  - 7: neutral, water
  - 0-7: acid, acidic chemical

G.) DEVELOPER SPECIFIC GRAVITY
- Quarterly/Every 3 months/Weekly
- Not greater than 0.004

SPECIFIC GRAVITY
- The amount of water versus chemical

HYDROMETER
- A device that measures specific gravity

H.) PROCESSOR CONTROL CHART MONITORING
- Daily
- Early in the morning
- After the automatic processor reached its maximum capacity or has been warmed up
- Not greater than 0.15 SD from baseline measurements
- Speed and contrast indication

FILM SENSITOMETRY
- Quantitative measurement of response of film to exposure and development
  - DEVICES USED:
    - Sensitometer: optical step wedge
    - Penetrometer:
    - Aluminum step wedge
    - Alternative for sensitometer
    - Densitometer: measures the density of exposed film
    - Step Table
    - Sensitometric strips

CONTROLS:
- Film speed
- Film contrast
- Film latitude
- Contrast using hydroquinone

ENVIRONMENT
Very important to film

POSSIBLE CONSEQUENCES OF STORING UNEXPOSED FILM IN ENVIRONMENT WITH IMPROPER TEMPERATURE AND RELATIVE HUMIDITY

- Temperature too high: increased fog level
- Temperature too low: increased static discharges
- Humidity too high: increased fog level
- Humidity too low: increased static discharges

STATIC ARTIFACTS

- Positive artifacts (black)

NECKLACE

- Negative artifacts (white)

TEMPERATURE AND HUMIDITY

- Inversely related
- Increased Temperature – Increased Heat Fog – Increased Possibility of Static Artifacts

PACKAGING OF FILM

- Photo-inert photoethylene bag or metal foil
- RATIONALE: to protect film from moisture and light

FILM STORED

- Must be protected from:
- Heat
- Radiation
- Chemical fumes
- Pressure

EXPIRATION DATE

- Adhere First In First Out (FIFO)
- RATIONALE: to beat the expiration date

HANDLING OF FILM

- AVOID:
- Hand cream
- RATIONALE: finger print marks (negative density mark)
- Rubber gloves
- RATIONALE: static artifacts (positive density marks)
- Cotton gloves can be used

KINDS OF FOG THAT CAN AFFECT THE FILM

X-ray machine is utilized
CONTROL FILM/CONTROL BOX
The film used
Exclusively used for film sensitometry

AUTOMATIC PROCESSOR
Develop film

SENSITOMETRIC STRIP/STEP TABLET
Made by exposing successive areas on a film with one exposure
The image from least to maximum OD
11 or 24 strips
Dmax to Dmin

DENSITOMETER/TRANSMISSION DENSITOMETER
A device that measures the percentage of light transmittance
Base Density/Manufacturer's Film Density: 0.14 OD
Light Transmitance: 100% (0 OD), 10% (1 OD), 1% (2 OD) & 0.1% (3 OD)

GRAPHING PAPER/CONTROL CHART
For plotting the H & D curve
Hurter & Driffield

OPTICAL DENSITY
Human eyes has a logarithm of response
Noticeable
Formula: Log10 (Ii/It) or Log10 (Io/It)

SENSITOMETRIC CURVE
The product of sensitivity
Film characteristic curve or H & D curve
Base Plus Fog: lowest portion (0.18 OD)
Toe: Dmin, Phenidone
Shoulder: Dmax, Hydroquinone
Straight Line Region: Film gamma
Steeper = good contrast
Film contrast, Exposure latitude, Speed/Sensitivity, Automatic processing, Phenidone & Hydroquinone

BASE DENSITY
The density from the manufacturer of the film
It is inherent in the film base
Average: 0.14 OD

BASE PLUS FOG
Inherent fog cause by processing conditions

LUMINESCENCE

Emission of light from the screen when stimulated by radiation

FLUORESCENCE

The ability of phosphor to emit visible light only while expose to x-ray
During x-ray exposure or while/promptly emitted or within 10-8
Important to Radiography

PHOSPHORESCENCE

Continue to emit light even after x-ray exposure
When x-ray exposure ceases or stopped
Somewhat after 10-8
Delayed emission
Important to Fluoroscopy

Light leak in processor
Developer improperly mixed

PINKISH/DICHROIC STAIN
Contamination of developer by fixer (chemical fog)
Developer or fixer underreplenishment

BROWN STAIN/THIOSULFATE
Inadequate washing

EMULSION REMOVED BY DEVELOPER
Insufficient hardener in developer

MILKY APPEARANCE
Fixer exhausted
Inadequate washing

STREAKS
Dirty processor rollers
Inadequate washing and drying

ALTERNATIVE PROCESSING METHODS

1.) RAPID PROCESSING
30 seconds
Useful for angiography, special procedure, surgery & emergency room
More concentrated chemicals
Higher developer and fixer temperature
2.) EXTENDED PROCESSING
3 minutes
Mammography
For single emulsion only
Advantages: greater image contrast & lower patient dose
Disadvantage: longer dry-to-drop time

3.) DAYLIGHT PROCESSING
2 minutes
Receive film in 15 seconds
Uses microprocessor
Advantages: no darkroom required & speed

RADIOGRAPHIC ARTIFACTS
Unwanted image

POSITIVE DENSITY ARTIFACT
Radiolucent appearance

RADIOGRAPHIC DEFINITION/RECORDED DETAIL
Clarity and sharpness
- Umbra: true image
- Penumbra: geometric unsharpness; the blurred areas around the umbra

DISTORTION
- Used to removed superimposition
- Magnification:
- Distortion in size
- Increase FFD – Decrease OFD – Decrease magnification
- Foreshortening/Elongation:
- Irregular magnification
- Distortion in shape
- Affected by CR part-film alignment

RELATIONSHIPS
- Increase mAs – Increase Density
- Decrease mAs – Decrease Density
- Increase kVp – Increase Density – Decrease Contrast
- Decrease kVp – Decrease Density – Increase Contrast
- Increase SID – Decrease Density – Increase Detail – Decrease Distortion
- Decrease SID – Increase Density – Decrease Detail – Increase Distortion
- Increase OID – Decrease Density – Increase Contrast – Decrease Detail – Increase Distortion
- Decrease OID – Increase Density – Decrease Contrast – Increase Detail – Decrease Distortion
- Increase Grid Ratio – Decrease Density – Increase Contrast
- Decrease Grid Ratio – Increase Density – Decrease Contrast
- Increase Film-Screen Speed – Increase Density –Decrease Detail
- Decrease Film-Screen Speed – Decrease Density – Increase Detail
- Increase Collimation – Decrease Density – Increase Contrast
- Decrease Collimation – Increase Density – Decrease Contrast
- Increase Focal Spot Size – Decrease Detail
- Decrease Focal Spot Size – Increase Detail
- Increase CR Angle – Decrease Density – Decrease Detail – Increase Distortion

CONTROL OF SCATTER RADIATION

PRODUCTION OF SCATTER RADIATION

TWO TYPES OF X-RAYS RESPONSIBLE FOR THE OPTICAL DENSITY & CONTRAST ON A RADIOGRAPH
1.) X-rays that pass through the patient without interacting
2.) X-rays that are scattered within the patient through Compton interaction

REMNANT X-RAYS

2.) INTERSPACE MATERIAL
- Radiolucent material
- Purpose: to maintain a precise separation between the delicate lead strip of the grid
- Compositions:
- Aluminum (Al)
- Advantages Over Fiber:
- High atomic number
- Produces less visible grid lines
- Nonhygroscopic: does not absorb moisture
- Easier to manufacture
- Disadvantages Over Fiber:
- Increases absorption of primary beam
- Results: higher mAs & higher patient dose
- Plastic fiber
- More preferred than Al
- Size: 350 µm wide

THREE IMPORTANT GRID DIMENSIONS
- 1.) Grid Strip Thickness (T)
- 2.) Interspace Material Width (D)
- 3.) Grid Height (h)

GUSTAVE BUCKY (1913)
- He invented stationary grid
- He demonstrated the technique for reducing the amount of scatter radiation that reaches the IR

GRID CONTRUCTION CAN BE DESCRIBED BY:

1.) GRID RATIO
- The height of the grid divided by the interspace width
- Formula: grid ratio = h/D
- h = the height of the lead strips
- D = the distance between lead strips
- High Ratio Grid:
- Advantage Over Low Ratio Grid:
- More effective in cleaning up scatter radiation
- Rationale: angle of deviation is smaller
- Disadvantage: increases patient dose
- General Radiography: 8:1 to 10:1
- Mammography: 4:1 to 5:1

2.) GRID FREQUENCY