Gamma Radiography Equipment

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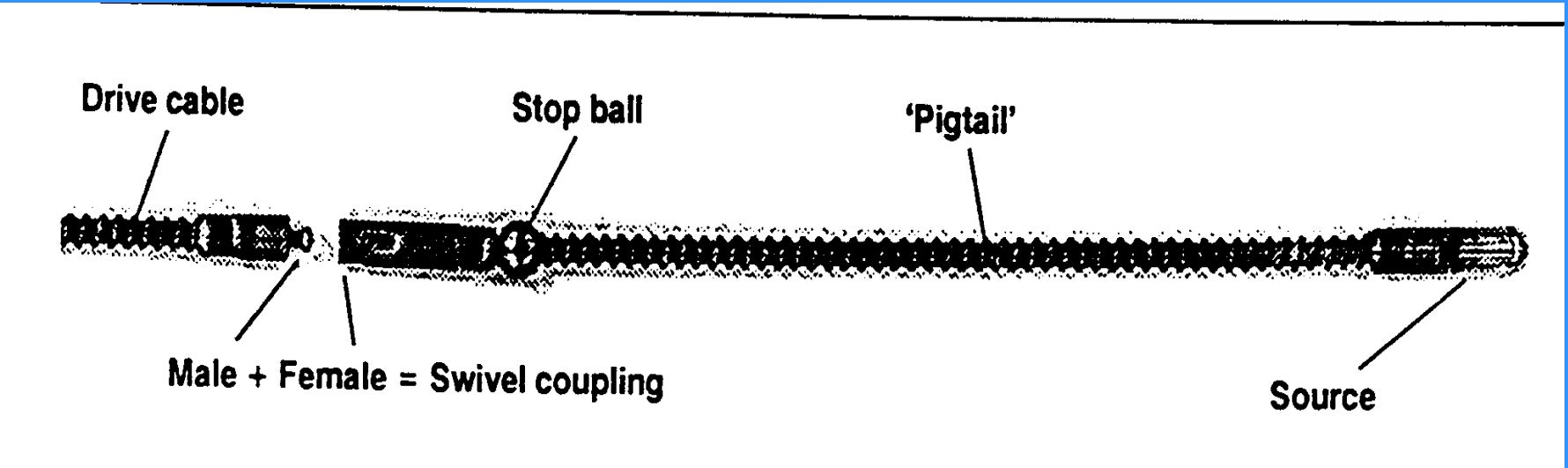
SEALED SOURCE FOR RADIOGRAPHY

Radioisotopes for Radiography

source	type	halflife	Energy (MeV)
Radium	Natural	1590yrs	0.6, 1.12, 1.76
Radon-222	Natural	3.28 days	0.6, 1.12, 1.76
Co-60	Art.	5.3 years	1.17, 1.33
Cs-137	Art	33 years	0.667
Th-170	Art	127 days	0.084
Ir-192	Art	74 days	0.29, 0.58, 0.60, 0.61
Se-75	Art	120 days	0.12-0.97
Yb-169	Art	32 days	0.008-0.31

source assembly-pig tail



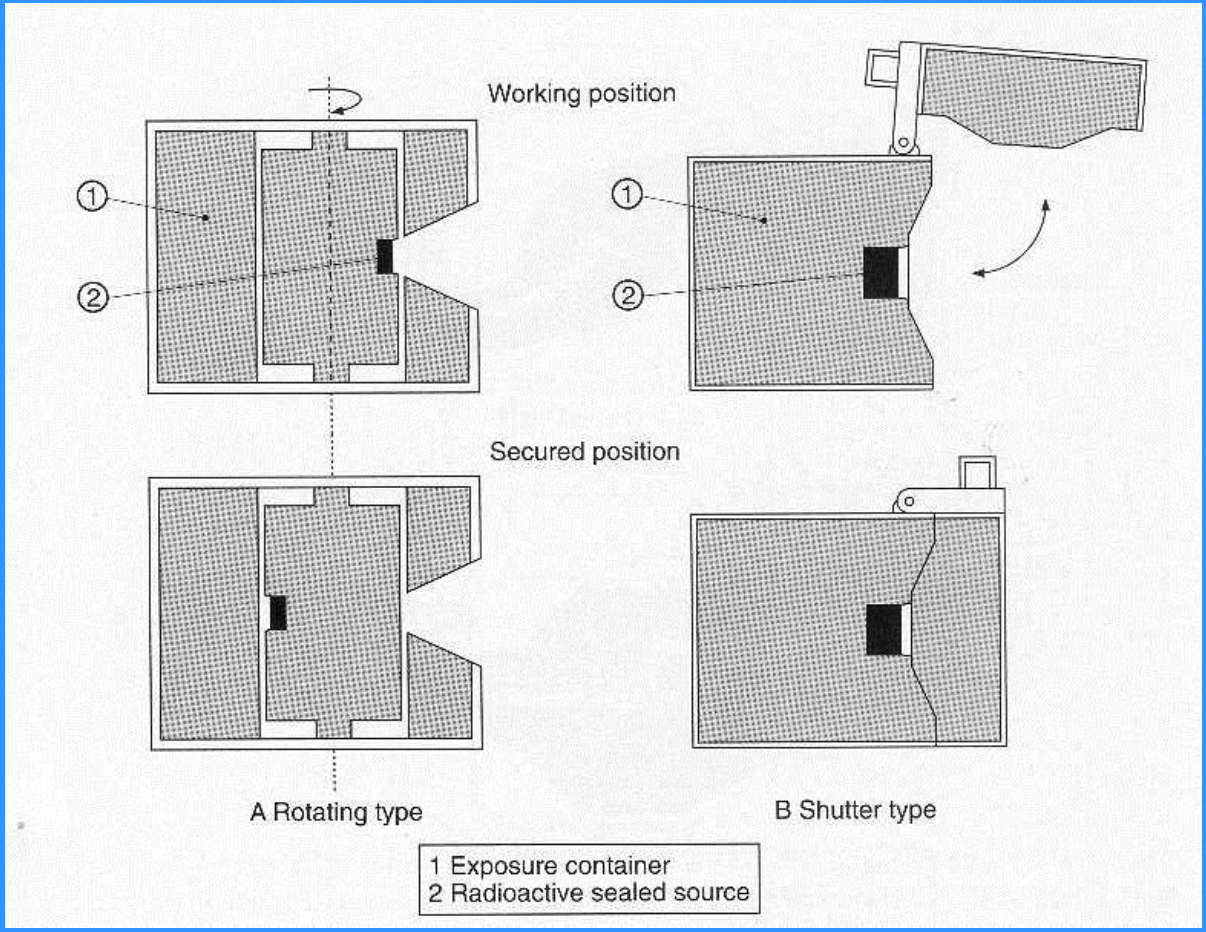
Factors Influencing the Selection of Radiography Source

- Half life
- Energy of gamma source
- Size of the source
- Specific activity
- availability

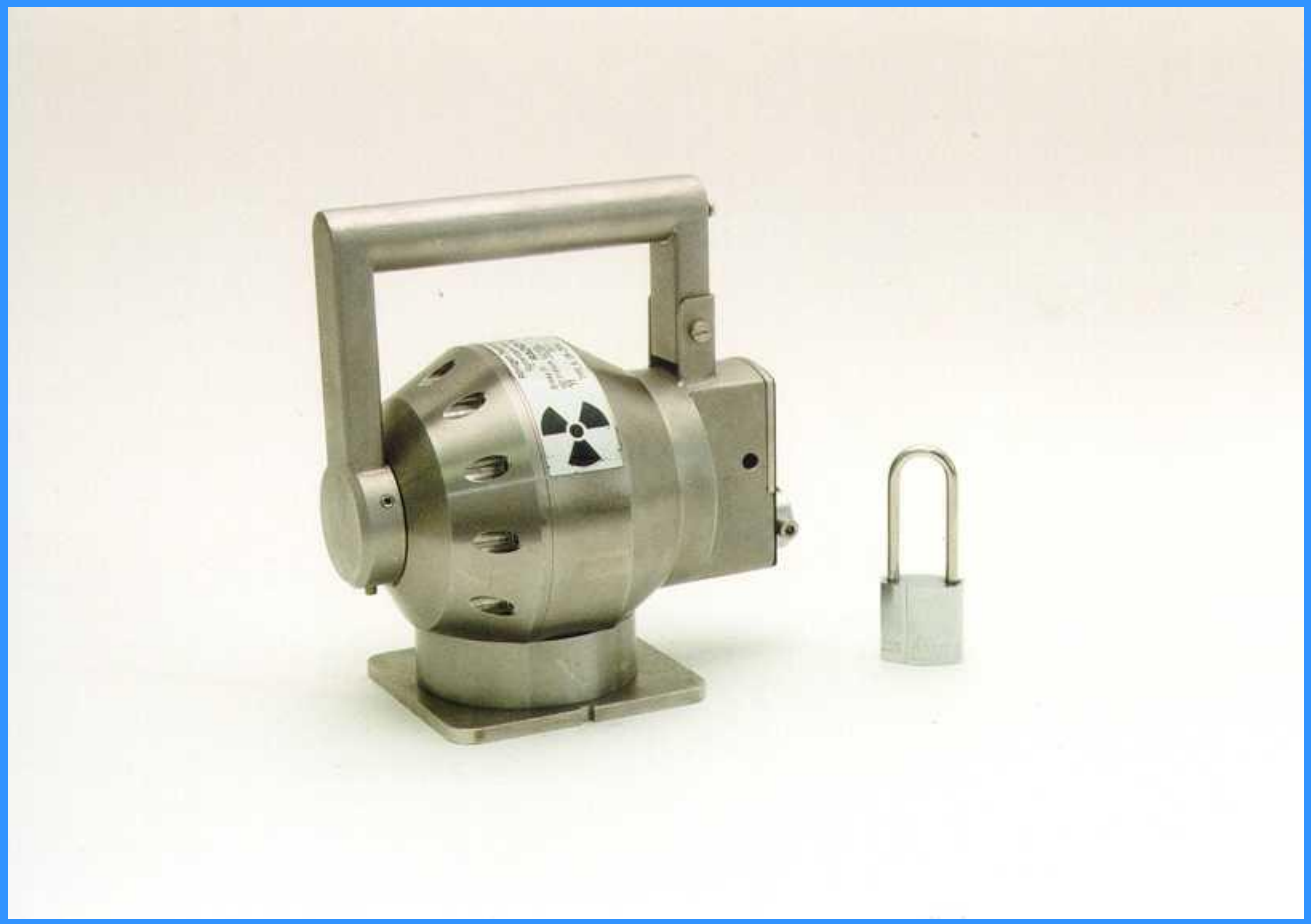
Category I Exposure Container

- Shutter type or Rotating type
- Source remains fixed inside the container all times
- Solid angle of beam usually smaller than 60°, further collimation possible
- Exposing by using a handle or remote means

Category I Exposure Container



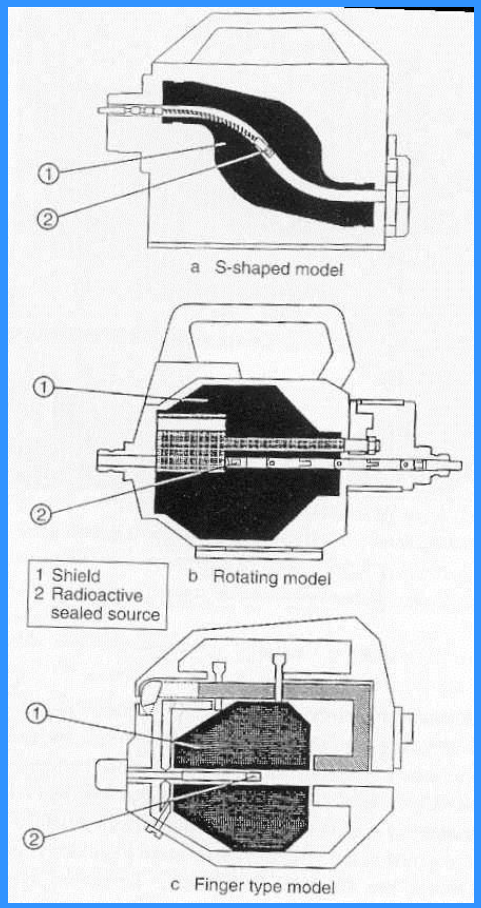
Category I Exposure Container

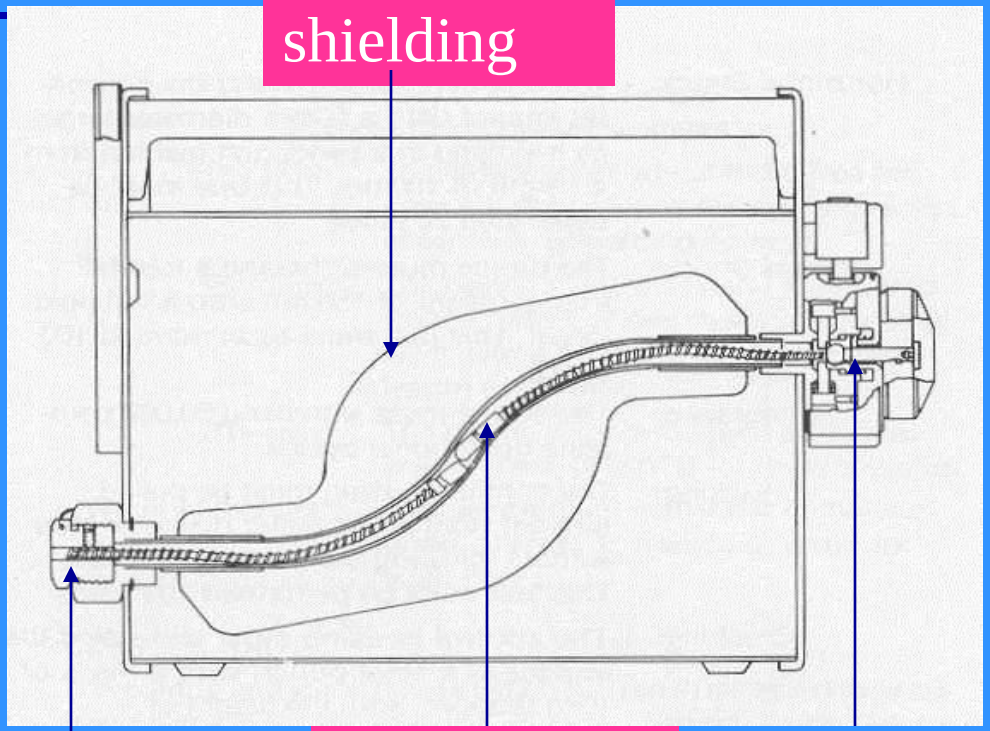


Category II Exposure Containers

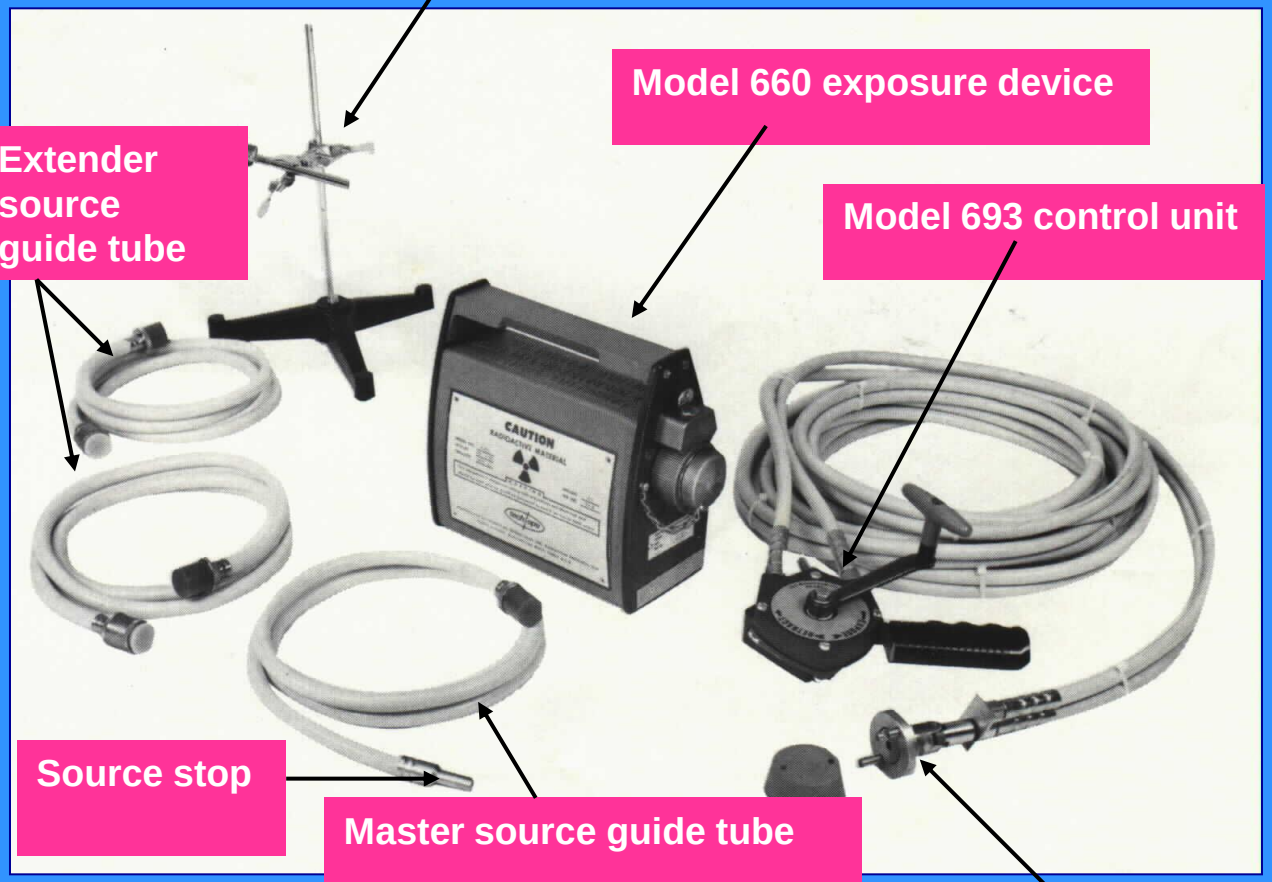
- Remotely controlled
- Source assembly is physically projected out of the shielded exposure container inside a guide tube to the end of this tube
- Projection done manually or by motor
- End of guide tube may be attached to a collimator
- Provide good distance between operator-source

Category II Exposure Containers





TYPICAL GAMMA PROJECTOR

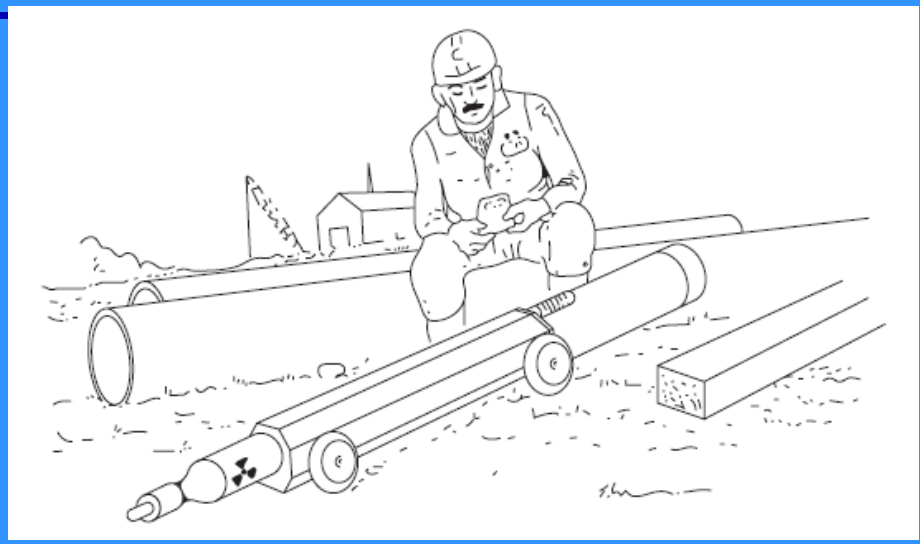


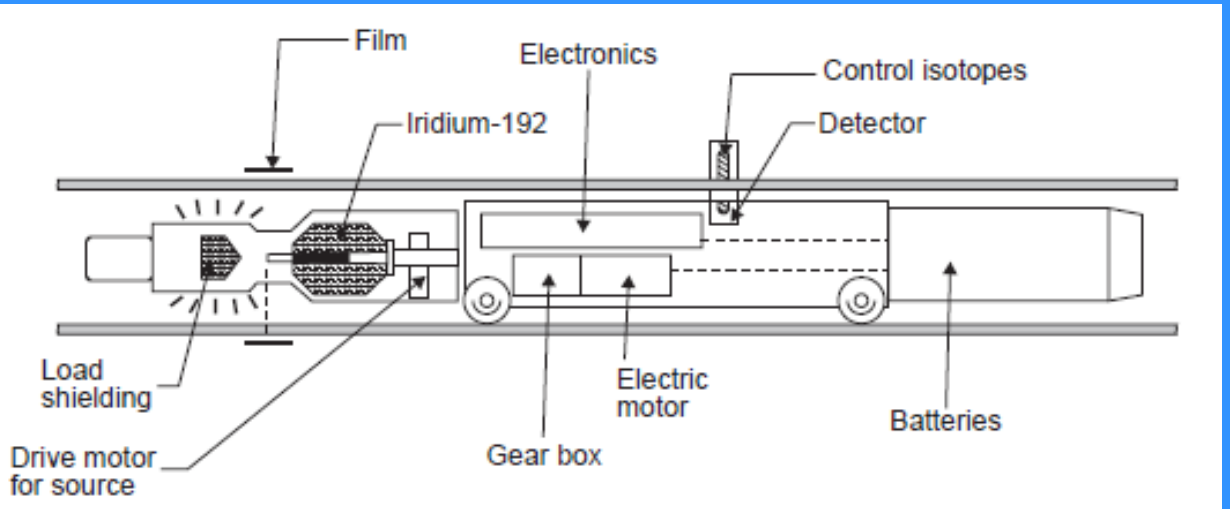
Gamma Projector

Sentinel 460
Source Projector

Sentinel 660
Source Projector

الزاحف Crawler :





Requirements for projection type containers

- Proper coupling between source assembly and the control cable
- Automatically secure of source in shielded position
- Protecting covers around connecting fittings or safety plugs
- Guide tubes shall have a closed end

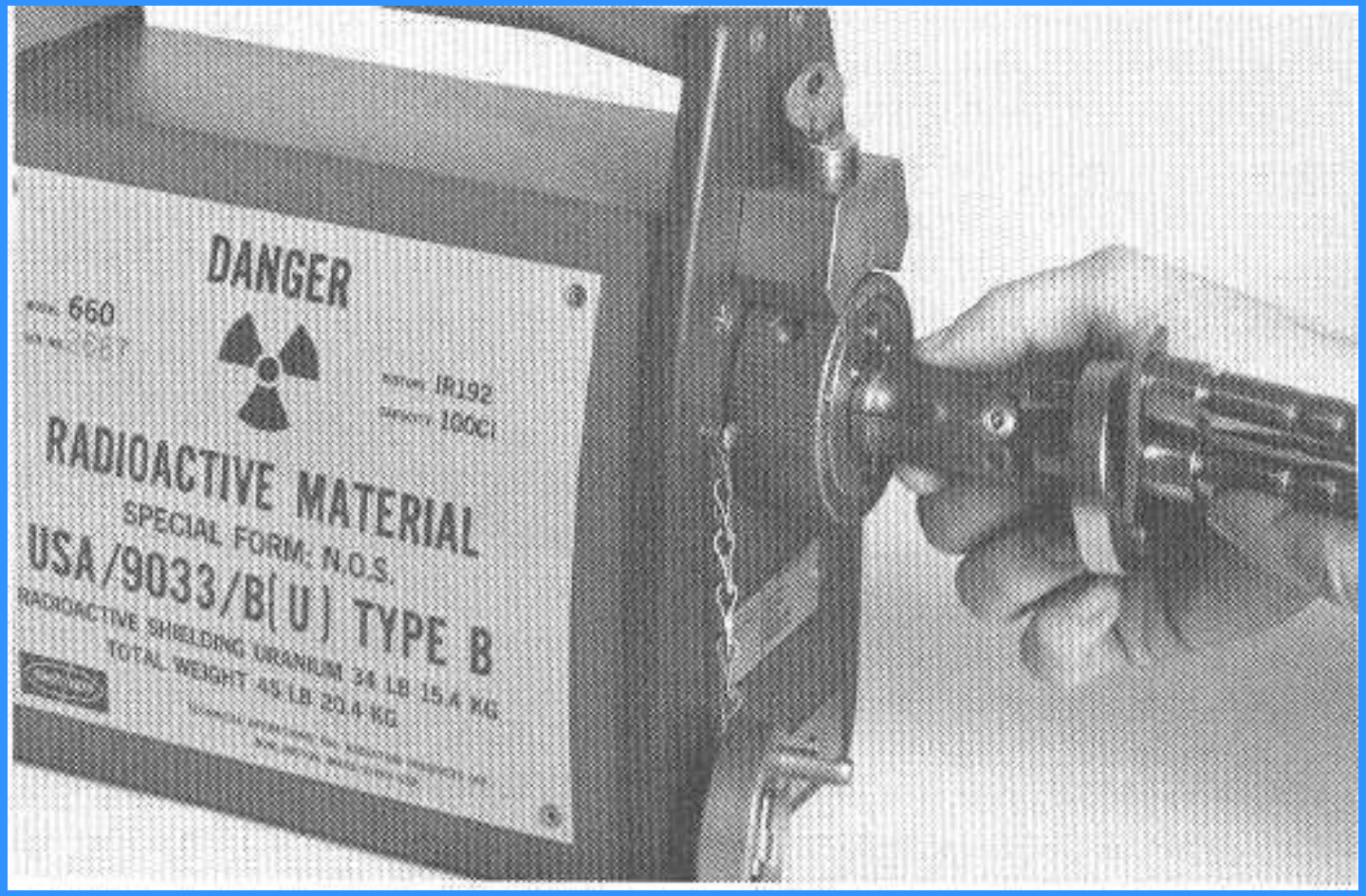
Requirements for projection type containers

- Drive cables shall have sufficient length
- Radiation levels: < 2 mSv/h at surface and < 0.1 mSv at 1 meter
- Ancillary equipment should be compatible

Label on Exposure Container

- Ionising radiation trefoil symbol
- “Danger - Radioactive Materials”
- Chemical and mass number of the Radionuclide
- Maximum source activity
- Model and serial number
- Licensee name and address

Label


DANGER
RADIOACTIVE MATERIAL
SPECIAL FORM: N.O.S.
USA/9033/B(U) TYPE B
RADIOACTIVE SHIELDING URANIUM 24 LB 15.4 KG
TOTAL WEIGHT 45 LB 20.4 KG

Torch Type Container

- Source mounted at the end of rod shaped holder which fits in a shielded source container
- During exposure the rod is manually inserted in a collimator.
- Radiographer is exposed to high dose rate
- Should not be used!!!

Requirements for gamma projector shielding material

- High specific mass
- High Z material
- Depleted Uranium or Tungsten
- Lead would make exposure container too big

Depleted Uranium

- be treated as radioactive material even if container is empty
- properly stored
- accounted for
- durably marked

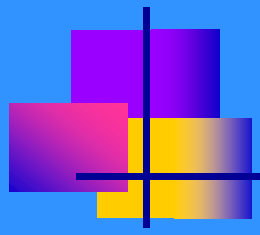
Classification of Projector According to Mobility

- Class P
  - a portable exposure container designed to be carried by one man
- Class M
  - A mobile but not portable exposure container designed to be moved easily by suitable means provided for the purpose
- Class F
  - A fixed installation exposure container or one with mobility restricted to a particular area

Class M

Maximum Radiation Leakage from an Exposure Container According to ISO 3999

Class	MDR (msV/hr) on the external surface	MDR (msV/hr) 50mm from the external surface	MDR (msV/hr) 1 m from the external surface
P	2	Or 0.5	0.02
M	2	Or 1	0.05
F	2	Or 1	0.1

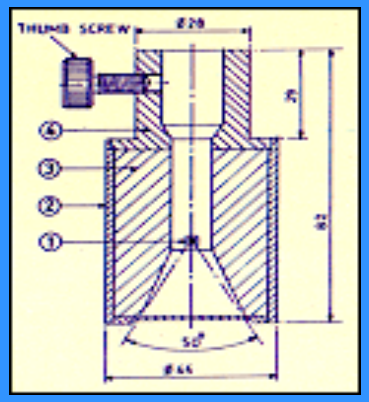


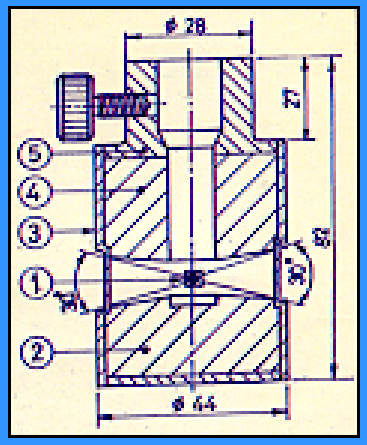
Collimators

- A device use to limit the emission of gamma to area of interest
- Normally made of lead
- reduce radiation levels
- dose to radiographers is reduced
- size of controlled area is smaller
- dose of intruders into controlled area will be smaller

Gamma-rays Equipment

Examples of collimator



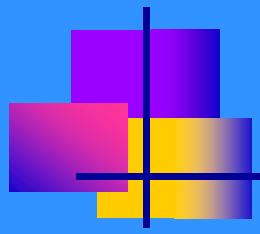


Source changing

- Process of removal of decayed source and installment of new source
- Done in exposure room
- Use source changer
- NOT to be performed by level 1 personnel

Advantages and Disadvantages of Using Radioisotopes (compare with x-ray)

- Advantages
  - Cheaper
  - Easier to transport
  - Smaller size allow to pass smaller diameter opening
  - Equipment is rugged and easy to operate
  - High penetrating power (good for thick material)
- Disadvantages
  - Cannot be turned off
  - Produce less contrast radiograph
  - Energy cannot be varies
  - Need frequent replacement



THANKS FOR YOUR ATTENTION