

Specification of Fuel Rod Scanner & Cf-252 Source

1. Nuclear Fuel Rod Scanner

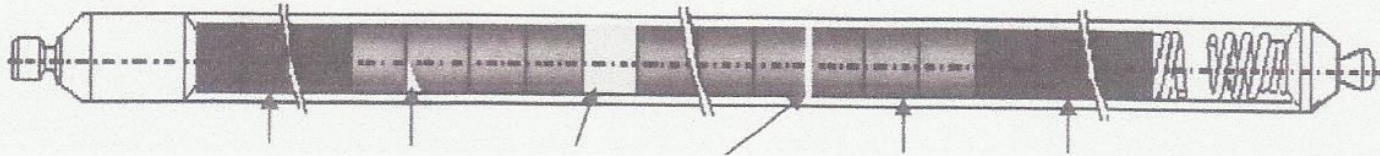
a) Purpose :

- **Non destructive inspect of the nuclear fuel rod defects
by using the radiation**

b) Inspected Defects:

- - fuel pellet(**LWR UO₂ and UO₂-Gd₂O₃**) enrichment level
- - average enrichment level over the fuel length
- - pellet missing or different pellet
- - pellet crack or damaged
- - gap between pellets
- - spring missing
- - rod length

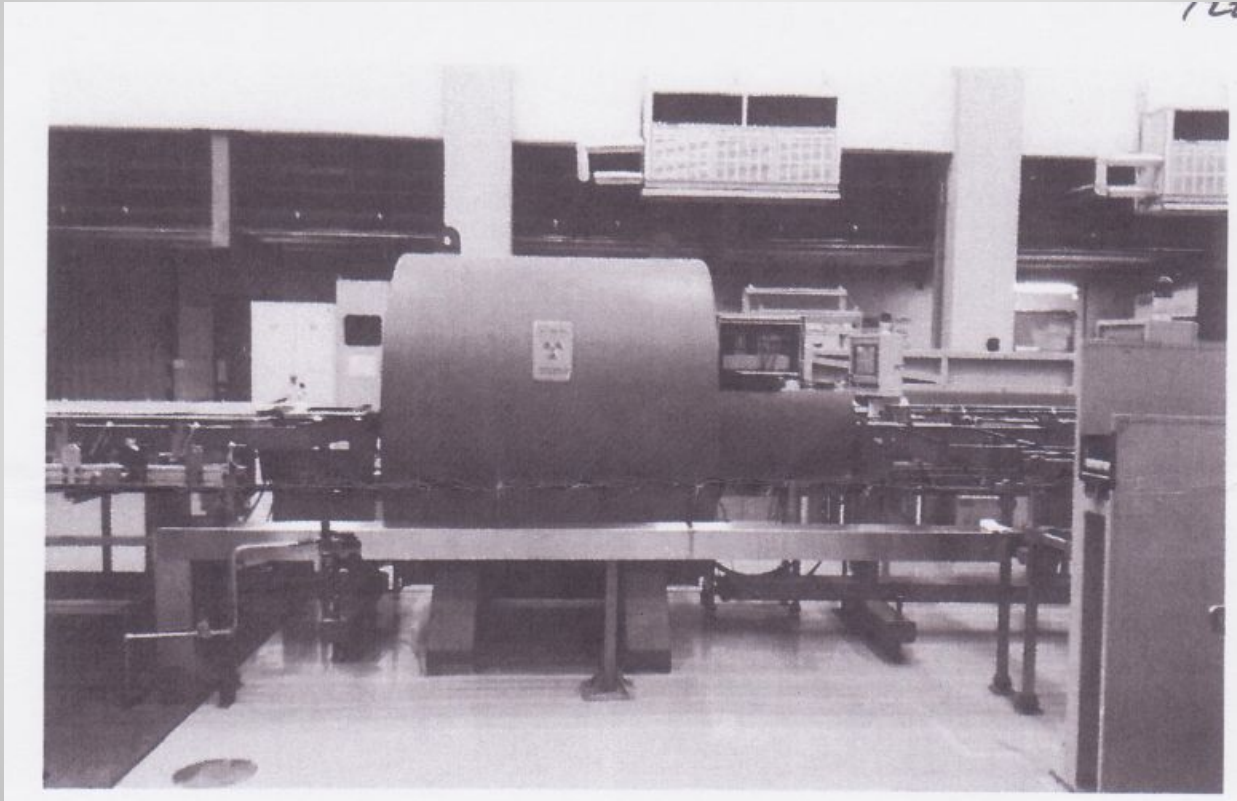
- 2. Rod Specification



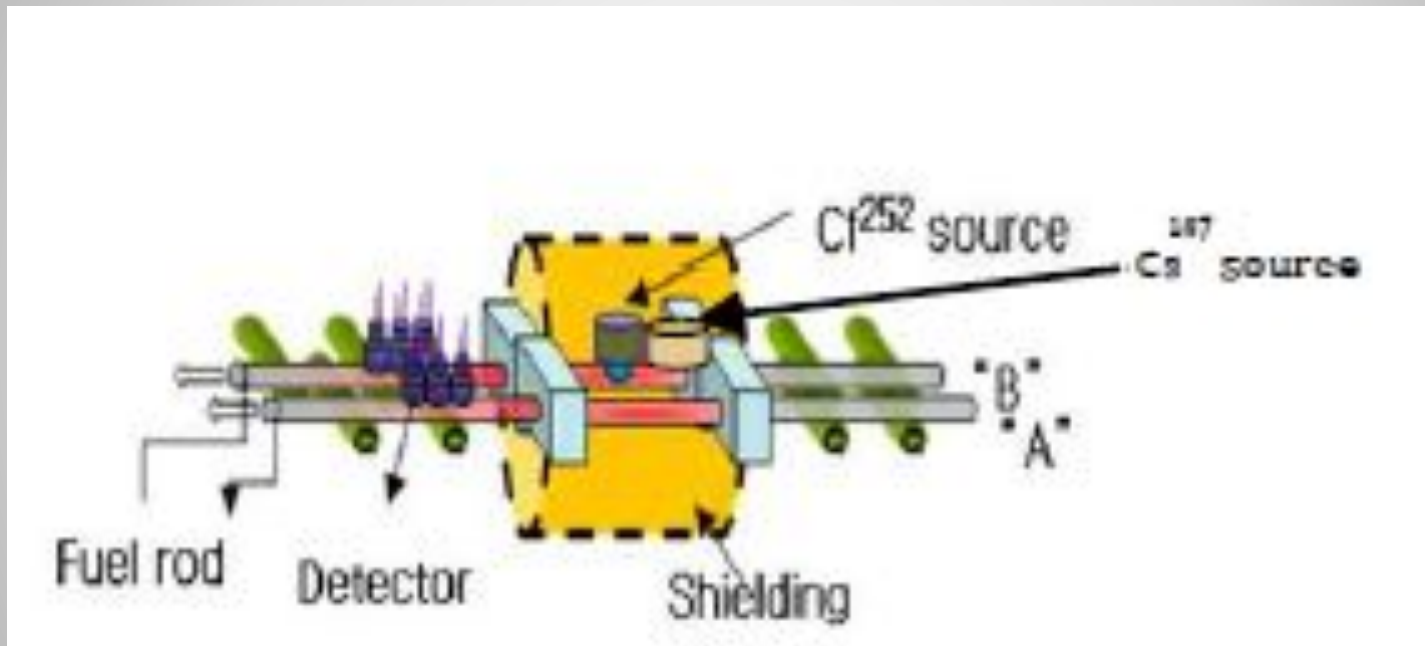
part name	dimension(mm)	part name	dimension(mm)
upper end-plug	11.2	fuel length	3810
spring	254	lower end-plug	19.28
Zone 1	152.4(15 pellets)	rod length	4094
Zone 2	3505.2(358 pellets)	tube	9.5*4070

3. Scanner Outside Figure :

- Rod Scanner Figure in use



4. Rod Scanner inside Structure



5. Design Criteria

- 1) The Scanner's inspection capacity is 1,400 Rods per 8 hrs operation time (including preparation time etc.)**
- 2) The scanner should have 2 Passes through which the rod passes, and the rod's passing time on the source should be same or lower than 6 sec.**
- 3) The number of the hole for the neutron source(Cf 252) loading is 8.**
- 4) The actual operation number of the hole is 2 and the source(Cf 252) weight per one hole should be $0.7 \text{ mg} \pm 10\%$ (Total weight 1.4 mg). And**
 - the replacement interval of the source should be commented.**
- 5) The shield design criteria is that the radiation rate should**

6) The bar code will be carved on the rod, so the scanner should have a bar code recognition system.

7) The source replacement should be convenient.(In case of the existing scanner, the rod conveying system should be dismantled for the replacement.)

8) The operation program should be LINUX Based RTOS C++.

9) The gamma ray detector should be BGO Scintillation PMT integrated style.

* The Design Criteria can be adjusted if the required performance is satisfied.

6. Cf-252 Specification

- 1) Neutron Source RI : Cf252 (Californium-252)
- 2) Total Weight : $1.40 \pm 10\%$ ($0.70 \pm 10\% * 2$) mg
- 3) Physical form : Pt-Cf Wire Alloy
- 4) Chemical form : Cf₂O₃
- 5) Capsule Dimension
Ø: 0.37Inch
Length : 1.48 Inch
Screw type : "+" 10-32
- 6) Extension Rod Dimension
Ø: 0.37Inch
Length : 23 1/2Inch
Screw type : "-/+ " 10-32