



TLD PERSONNEL MONITORING SERVICE USERS INSTRUCTION MANUAL

(KINDLY PRESERVE THIS INSTRUCTION MANUAL FOR FUTURE REFERENCE)

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INTRODUCTION:

Personnel doses, received by Radiation Workers, are determined from measurements made from Thermo luminescent Dosimeters carried on the person. This type of dose estimation is called Personnel Radiation Monitoring.

Aim of personnel monitoring program as outlined in Radiation Protection Rules-1971, promulgated by Government of India under Atomic Energy Act 1962 (33 of 1962) is to:

1. Monitor and control individual doses regularly in order to ensure compliance with the stipulated dose limits.
2. Report & investigate overexposures & recommend necessary remedial measures urgently.
3. Maintain lifetime cumulative dose records of the users of the service.

As a rule, no person is permitted to work in the radiation (X-rays, gamma rays, betas and/or Neutron) field without the use of a proper personnel monitoring badge/device unless exempted and authorized by Radiological Physics & Advisory Division, Bhabha Atomic Research Centre, Mumbai. In case of any employer/manager or some other person compels a worker to perform certain radiation work without providing personnel monitoring badge, the matter must be immediately brought to the notice of

The Head,
Radiological Physics & Advisory Division.
Bhabha Atomic Research Centre,
Mumbai - 400 085

And

Atomic Energy Regulatory Board (AERB),
Niyamak Bhavan, Anushaktinagar,
Mumbai - 400 085.

1) GENERAL FEATURES OF TLD BADGES

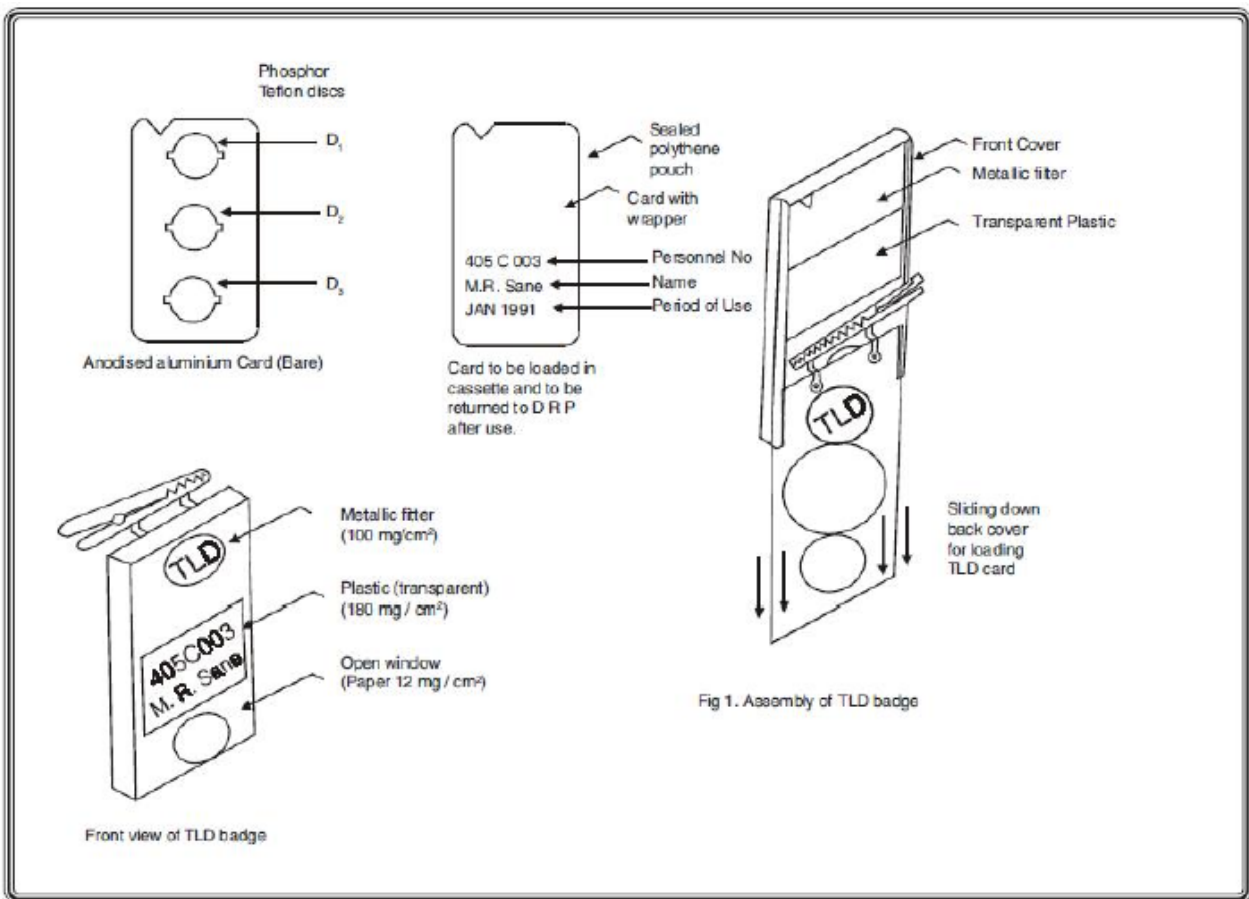
- a. It is used to measure external individual doses from X, beta and gamma radiations. It consists of a TLD card loaded in a cassette having suitable metallic filters. It is based on the phenomenon of thermo luminescence, the emission of light when certain materials are heated after exposure to radiation. It gives very reliable results since no fading is observed under extreme climatic conditions (ambient temperature and humidity).
- b. **TLD card:** A TLD card essentially consists of three CaSO₄: Dy-Teflon TLD discs (13.3mm dia x 0.8 mm thick) mechanically clipped over three symmetrical circular holes each of diameter 12 mm, on a nickel plated aluminum plate (52.5mmx29.9mmx1mm). An asymmetric V cut provided at one end of the card ensures a fixed orientation of card in the TLD cassette. A thin paper wrapper (12mg/cm²) provides personal data & the period of use. To protect the TLD discs from dust and mishandling, the card along with its wrapper is sealed in a thin plastic (polythene) pouch. Pouch also protects the card from radioactive contamination while working with open sources.
- c. **TLD Cassette:** TLD cassette (card holder) is made of high impact plastic. TLD card when inserted in the proper position in the cassette will have the first disc (D1) sandwiched between a pair of filter combination of 1 mm Al & 0.9 mm Cu (1000 mg/cm², total thickness). Copper filter is nearer to the TLD disc. The second disc (D2) is sandwiched between a pair of 1.5 mm thick plastic filters (180 mg/cm²). The third disc (D3) is positioned under a circular open window. A clip or strap attachment affixes the badge to the user's clothing or to the wrist.

Types of TL badges

1. **Chest badge** : used for estimation of the whole body dose, worn at the chest level.
2. **Wrist badge**: has a strap to be worn around wrist. It is used to estimate the dose to hands and to the forearms when they are likely to be selectively exposed.

Unloading and loading of TL card into cassette: Clip is fixed on the back cover of the cassette sliding the back cover of the cassette in the direction of the arrow (Fig-1) removes the back cover. The card along with the sealed polythene cover can be pushed out of the cassette. Fresh card with its polythene cover can be positioned in the cassette taking care of the V notch positioning. Back cover can be slid back to close the cassette.

FIG/ 1



2) SERVICE PROCEDURE

- a) On receipt of a request from an institution desirous of availing of the TLD personnel monitoring services, **Avanttec Laboratories Pvt. Ltd** will send copies of the application form for Personnel Monitoring (TLD/2 form), the personal data form (TLD/4) and User's Instruction Manual. The application form and personal data forms for all persons to be monitored, should be duly filled in and returned to

Seniour Scientific officer
AVANTTEC LABORATORIES PVT LTD.
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- b) Depending on the radiation work and the sources being handled, the institution will be informed about the total number of TLD badges for use on chest/wrist.
- c) The first consignment of TLD badges containing TL cards along with TLD/5 form will be sent by Registered Post/Courier. This will be for a specified period of use.

3) SERVICE PERIOD

- a) Depending upon the type of installation, TLD service to an institution may be on monthly or quarterly basis. The institution will be intimated about the same.
- b) After one service period, the used cards have to be replaced by the fresh cards sent by Avanttec Laboratories Pvt. Ltd for the next service period.

NOTE:

- 1) For all purposes only one address will be kept in our records. Hence address of the branches / temporary sites can not be entertained.
- 2) Since the materials are sent by Registered Post/Courier, instead of individual's name, designation e.g. Officer-In-Charge, Doctor-In-Charge, Director, etc., should be given in the address.
- 3) The address should be completed with pin code, Phone no., Fax no, Telex no, email address. Each institution and all radiation workers to be monitored will be allotted an Institution number and personal number by Calibration & Dose Records Section, Radiological Physics & Advisory Division, Bhabha Atomic Research Centre, Mumbai - 400 085, which will be intimated to the user institution by BARC/Avanttec Laboratories and the same should be referred to in all future correspondence with us. Normally the TLD cards for use during a particular period will be sent in advance so as to reach the user institution during the last week of preceding month. In case the TLD cards/cassettes are not received in time as stated above or there is any discrepancy in the receipt of the materials, the same should be intimated to us immediately.

4) WHO SHOULD USE

- a. The TLD badges to be used only by persons as approved by AERB directly working with radiation sources such as X-ray units, radioisotopes etc. The dark room technicians, sweepers helpers etc. need not normally be provided with TLD badges. In case of doubt kindly write to AVANTTEC LABORATORIES PVT LTD.
- b. It may please be noted that the TLD badge is used to measure the radiation dose to which the use is exposed. It does not protect the user from radiation.

5) WHERE TO WEAR

- a. One TLD badge should be worn compulsorily at the chest level. **If a lead rubber apron is used, (e.g. in diagnostic X-ray departments) TLD badge should be worn under the lead apron at the chest level and same should be mentioned in the TLD/5 form.**
- b. The dose recorded by the TLD badge worn at the chest level represents the whole body dose equivalent.
- c. In special cases, depending upon the nature of radiation work, if the doses to the hands and forearms are expected to be significantly higher than at the chest level, additional wrist badges may be procured and used. Examples of such categories are persons handling radioisotopes from close distances and radiologists /doctors doing the special investigations such as cardiac catheterization, angiography's etc.
- d. Persons who working with industrial radiography cameras should compulsorily use wrist badges in addition to chest badge.

6) HOW TO USE

- a. The TLD cards shall not be used without being loaded in the holders. Once the card is loaded in the cassette it should not be removed till the end of the service period. It is not possible to determine the nature and energy of the incident radiation from a TL card used without a cassette and hence dose estimation will not be possible.
- b. Whenever working in the radiation field, TLD badge should be always worn by the person.
- c. A TLD badge allotted to one user should not be shared by any other person.
- d. Each institution should keep apart one TLD card loaded in a chest TLD holder as CONTROL which is required for correct dose evaluation. The control badge should be stored in a radiation free area where there is no likelihood of any radiation exposure. Places such as X-ray rooms, rooms in which radioactive materials are stored, handled or used and areas in the immediate vicinity of such rooms are **NOT RADIATION FREE AREAS and should be avoided for storing the TLD cards**. Kindly note that the TLD card and cassette for control TLD badge will also be charged.
- e. While leaving the premises of the institution, workers should submit their badges in the place where the control badge is kept. Also when no radiation work is being carried out, badge should be kept along with the control TLD badge.
- f. A TLD cassette holder showing any of its filters (metallic pieces) loose or falling off or otherwise damaged should not be used. Ask for replacement of such holders. The cassette for replacement will also be charged.
- g. ENSURE THAT YOUR BADGE IS NOT LEFT IN THE RADIATION FIELD OR NEAR HOT PLATES, OVENS, FURNACES, and BURNERS etc.
- h. Institutions using open/unsealed radioactive sources should periodically check the TLD cassette for radioactive contamination by using suitable instruments. The cassettes which are found to be contaminated should be disposed of at your end as radioactive waste. The contaminated badges should not be returned to us.
- i. Personal numbers are allotted to the radiation workers by Calibration & Dose Record Section, Radiological Physics & Advisory Div, BARC, Mumbai. They are permanent and should not be changed at your end.

7) HOW TO RETURN THE USED TLD CARDS

- a. Return all the cards, (not the cassette), used and /or unused, immediately after every service period in one lot along with the TLD/5 form within 5 days after the end of the service period provided the cards to be used for next cycle are received. Unused TLD cards should not be retained at the users end for use during subsequent period. Please note all the TLD cards sent should be accounted for by the user institution. In exceptional cases when fresh cards are not received in time, the old TLD cards may be continued to be used until the new cards arrive, but the extended period of use should be clearly indicated on the TLD cards by sticking a label on the polythene pouch and in the accompanying TLD/5 forms. Late return/ non-return of TLD cards do not serve the purpose of personnel monitoring.

- b. The institutions should always send back the TLD cards to be read by registered post. Sending of TLD by air courier should be avoided as it is possible that airport authorities will screen the package under X-Ray machine at the airport.
- c. If a TLD card is not used, the remark "not used" should be written on the TLD card as well as in the TLD/5 form against the name the card was assigned for.
- d. While returning, arrange the TLD cards in same order as listed in TLD/5 forms. Write the nature of radiation sources handled against the respective names in the TLD/5 form.
- e. Use plastic boxes for returning the cards to avoid loss during transit. The boxes in which we are sending the TLD cards may be reused for returning the TLD cards.
- f. If you envisage that some workers who are already availing the service are not going to work in radiation field in the immediate future, the information about that should be sent at least one month before the start of the next cycle. The no. of cards to be sent will be reduced accordingly.
- g. If high exposures to persons are suspected, their TLD cards can be returned immediately to us along with details of the incidence for urgent processing and necessary action.
- h. If a TLD card is lost at your end, a declaration stating the circumstances under which the card was lost, duly signed by the user and the officer-in-charge/R.S.O./Physicist, should be sent to us. The details of the radiation work done and the dose expected during the monitoring period should also be intimated to us. (Note that an amount of Rs.125/- will be charge for replacement).

8) CHANGES IN EQUIREMENT/ADDITION/DELETION OF NAMES

Specify the changes in the requirements, if any, clearly in the following format.

- a. Names to be added.
- b. Names to be deleted.
- c. Total monthly requirement of TLD cards.
- d. Additional requirement of chest/wrist TLD cassettes, if any, kindly do not state your requirements vaguely e.g. some TLD cards, use above format for clarity.
- e. A personal data form should be filled in for each radiation worker and the same should be sent to us. This will help us to maintain correct life-time dose records of the radiation workers. All new names should be accompanied by the completed personal data forms. A copy of personal data (TLD/4) form is attached along with this manual.
- f. Intimation regarding changes in the requirements or suspension of service, if any, should reach AVANTTEC LABORATORIES PVT LTD one month in advance of the intended period of use. This intimation should be sent by a separate letter duly signed by authorized person, and not in the TLD/5 form.
- g. All cassettes and TLD cards once dispatched by us, irrespective of whether used or unused will be charged.

9) UNITS OF EQUIVALENT DOSE

- a. Sievert is the unit of Radiation Equivalent Dose
- b. $1 \text{ Sievert (Sv)} = 1 \text{ joule/Kg} = 100 \text{ Rem}$ $1 \text{ milliSievert (mSv)} = 1/1000 \text{ Sv} = 100 \text{ mRe}$

10) EQUIVALENT DOSE/EFFECTIVE DOSE

- a. The cumulative effective dose (whole body dose) constraint for five years block (from Jan.1999 to Dec.2003) shall be 100 mSv i.e. average 20 mSv per year in this five year block. In one calendar year in this period the individual effective dose (whole body dose) shall not exceed 30 mSv.
- b. Annual equivalent dose limit for the skin, the hands and feet is 500 mSv and for the lens of the eye is 150 mSv.
- c. However it is strongly recommended to control and minimize the individual doses to as low as possible by following good work practice. In this connection it is suggested that all individual whole body doses exceeding 1mSv (100 mRem) in a service period may be investigated and justified at your end.
- d. Women radiation workers of reproductive age shall normally be employed in areas where radiation shall be at uniform rate not more than 20 mSv per year. When pregnancy has

been diagnosed, arrangements should be made to ensure that she will work only in the areas where exposures are most unlikely to exceed 2 mSv (200mRem) during the remaining period of pregnancy.

11) DOSE REPORTS

- a. The dose reports are sent after processing the respective personal TL cards and contain current period doses and the up-to-date cumulative doses of the current year. Doses are reported in units of mSv (millisievert).
- b. Annual dose reports are sent after the end of the year and contain annual doses and cumulative life time doses of all radiation workers. Any discrepancy in the annual dose report should be intimated to us promptly and positively within three months from the date of dispatch of the report. Complaints received subsequent to this period will not be entertained.

12) OVER EXPOSURES

- a. Dose equivalent recorded by the chest badge exceeding 10 mSv (1000 mRem) is treated as overexposure and the same is reported promptly to the institution and the individual concerned. The institution should arrange to investigate the causes of overexposure and report the findings to Avanttec that will be communicated to the appropriate authorities for overexposure at BARC.
- b. The persons receiving more than 100 mSv will be subjected to hematological examination including differential blood counts and chromosome aberration test at Bhabha Atomic Research Centre, Mumbai- 400 085.
- c. After receiving the investigation reports from the institution the overexposure cases are reviewed by BARC and advise on necessary follow-up will be intimated to the concerned institution.

13) TERMS & CONDITIONS OF PERSONNEL MONITORING SERVICE

Charges : The charges for TLD cards & Cassettes are as follows:

- a. Processing charge per TLD Card Rs.100/-
- b. Lost/Tampered/Overexposed/contaminated card which needs to be replaced. Rs.141/-
- c. Chest TLD cassettes Rs.84/-
- d. Registration charges for new radiation worker. Rs.150/-

BILLS/Invoices

- e. Based on the normal requirement of TLD cards of institution, **an estimated annual bill will be sent as advance Bill at the beginning of the year.** Final bill will be sent at the end of the year taking into account, the actual material supplied & the amount received against advance bill.
- f. The bill will contain only details of material supplied and no details of the purchase or dispatch voucher / postal receipt references will be quoted. Such records, if necessary, should be maintained by the institution to ensure prompt payments of the bills.
- g. TLD personnel monitoring services bills should be paid immediately within 30 days on receipt of estimated bills by demand draft in favor of M/s. AVANTTEC LABORATORIES PVT LTD, payable at Chennai. Bank commission for demand draft will be borne by institution concerned.
- h. If the institution fails to send the payment towards the estimated bill within 30 days from the date of receipt of bill, then service is liable to be suspended/terminated and Head, Radiological Physics & Advisory Division, BARC, Mumbai & Atomic Energy Regulatory Board will be informed accordingly.

OTHER TERMS & CONDITIONS

- i. This contract is subject to the jurisdiction of the courts of Chennai only.

14) IMPORTANT INSTRUCTIONS

- a. Please quote the institution number in all correspondence regarding TLD personnel monitoring service. Actions are liable to be delayed if correct TLD institution number is not quoted.
- b. Address for all the correspondence regarding TLD personnel monitoring service:

SENIOR SCIENTIFIC OFFICER
Avanttec Laboratories Pvt. Ltd.,
76, 7th Street,
Porur Gardens, Phase-1
Chennai- 600 095.

- c. The service is liable to be suspended for any of the following reasons and Head, Radiological Physics and Advisory Division, BARC & Atomic Energy Regulatory Board will be informed accordingly.
 - i. Irregularities in returning the TLD cards for processing.
 - ii. Non-payment of bills within 30 days.
 - iii. The investigation reports for overexposure not sent promptly.
 - iv. Misuses of TLD badges like tampering of TLD card, deliberate exposure to the TLD badge etc.

FOR ANY FURTHER INFORMATION/CLARIFICATION, Please write/call to:

SENIOR SCIENTIFIC OFFICER
Avanttec Laboratories Pvt. Ltd.,
76 Ground Floor
7th Street, Porur Gardens, Phase-1
Chennai- 600 095.
Telephone: + 91 - 44 – 29300995
Mobile : +91 9345981511 / 9444400385
Email: tldlab@avanttec.net

T L D PERSONNEL MONITORING SERVICE
(INSTRUCTIONS FOR USERS OF T L D BADGES)

Dos and Don'ts

Do'S

1. Load the card properly in the TLD cassette. Name and personnel no should be in the front, visible from outside
2. Use TLD card of the valid service period
3. Handle the TLD badge with care
4. Store the badge in a radiation free place when not in use by you
5. Report any unusual radiation incident, to your supervisor / r.s.o / head of the institution
6. In the event of any doubt kindly contact personnel monitoring service (T L D)

Don'ts

1. Don't share your TLD badge with someone else; your badge is your own
2. Once loaded, don't open the badge till the end of the service period.
3. Don't pierce or open the sealed polythene pouch of the TLD card
4. Don't use a damaged or broken cassette/of which filters have come out. Ask for replacement.
5. Don't leave the badge in a radiation area, in washing machines or in the vicinity of hot plates, ovens or furnaces.
6. Don't wait till the end of the service period; if you suspect a high radiation exposure report it immediately to your supervisor who will arrange to send the TLD card for urgent processing.