

### N.6: Industrial and radiation safety in RRCAT

Several initiatives have been taken at RRCAT in order to develop safe working culture. Internal safety inspection committees, safety review committees and Apex Safety Committee (ASC) of RRCAT are regularly monitoring, reviewing and ensuring various safety related aspects. Internal safety inspection committees are regularly visiting various laboratories and buildings of RRCAT. Committees observe the industrial safety aspects and give recommendations to improve safety, wherever necessary. These safety inspections are carried out in the presence of Building Safety Officer (BSO) and deputy BSO of the respective buildings, and the reports are submitted to Apex Safety Committee of RRCAT.

Comprehensive Job Hazard Analysis (JHA) is a regular feature before starting of any critical task. It is done to identify any possible hazards during job execution. In November 2019, JHA for erection of main trusses of the high bay of R&D - I block was carried out before start of erection work. Similarly, one more JHA was carried out in March 2020, this was for extension of long travel for the crane installed at Indus 2 experimental hall.

Safety Review Committee for Indus Accelerators ensured that radiation fields and other parameters in the accessible areas were within the stipulated limits. The fire protection system was checked to ensure that it was working efficiently and there was adequate protection against noxious fumes and gases. All the safety measures were adequately taken against industrial hazards and non-ionizing radiation. A separate Construction Safety Committee is working to look into safety concerns at construction sites. The committee ensured that every worker who was involved at construction site was trained to use Personal Protective Equipment (PPE), like full body harness, helmet, shoes and gloves etc. All other safety review committees at RRCAT checked the safety issues related to design, modification, operation and maintenance works etc., and gave their recommendations to improve safety features and ensured the compliance for shortcomings, if found. All the recommendations and reports were put up for review and approval of ASC of RRCAT. ASC also reviewed the recommendations of AERB inspection team for the relevant period. The status of occupational health check-up of employees working in laser labs, workshops, chemical facility and radiation zone was also reviewed by ASC. During July – December 2019, occupational health check-up of 128 persons involved in hazardous operations and 259 persons working in radiation zone was performed. In addition, eye check-up of 175 persons involved in laser operations was also

done. Similarly, during January-June 2020, occupational health check-up of 31 persons involved in hazardous operations and 25 persons working in radiation zone was performed. In addition, eye check-up of 12 persons involved in laser operations was also done. Further, the operator and staff members were provided safety shoes and briefed about handling of PPE. Availability of first-aid boxes inside the buildings at easily accessible places was ensured.

Radiation safety surveillance for the radiation facilities Indus-1, Indus-2, Linac-3 (IMA building), IRFEL, gamma irradiation chamber, ARPF and other minor radiation facilities were carried out. During the operation of these facilities, radiation monitoring in the supervisory and controlled areas were carried out and radiation level in these areas was maintained within acceptable levels ( $<1\mu\text{Sv/h}$ ). Total of 495 staff working in the radiation area were provided with personal dosimetry devices during the period. Dose reports from Radiological Physics & Advisory Division (RPAD), BARC showed no personnel exceeding the annual dose limit of 20 mSv or quarterly investigation limit of 2 mSv. Quarterly status reports on radiation levels and personal dose data were sent to AERB. Indus-1 and Indus-2 users were imparted training in radiation safety and the safe practices to be followed while working near beam lines. Testing of area radiation monitors and beam loss monitors in Indus Accelerator Complex, measurements of induced radioactivity and testing of survey instruments were carried out during the period. Testing of all the equipment and safety gadgets of Emergency Response Centre (ERC) was carried out. Emergency kit was kept in a readiness state. Contact details of Emergency Response Team (ERT) members were updated and ERC is maintained in a preparedness state. Inventory check of radio-active sources in various labs of RRCAT was completed during the period.

Two staff members from Health Physics Unit, Indus Operation Division completed Radiological Safety Officer (RSO) certification course of 2 months duration at RPAD, BARC. Subsequently, one of them was nominated by RRCAT to AERB for approving as RSO for ARPF, for which the approval is obtained. The following technical support was provided by HPU during the period: (i) shielding evaluation of THz FEL facility, (ii) shield evaluation of 20 MeV microtron facility for BARC, (iii) revision of shield evaluation of Linac-3 vault in view of addition of alpha magnet for submission to AERB, (iv) detection of electrons above 10 MeV at ARPF using copper activation method and gamma spectrometry for ensuring regulatory requirement, (v) study on radiological safety of food products due to irradiation by electrons and x-rays, and preparation of a

technical note for release on the same, (vi) evaluation of shield adequacy of TL-2/TL-3 in Indus-1, (vii) Monte-Carlo simulation for the angular distribution of bremsstrahlung photons from 20 MeV, 450 MeV, 550 MeV and 2.5 GeV electrons bombarded on metallic targets, (viii) ozone measurements in SR beam lines, and, (xi) area dose mapping in Indus complex using TLD on HDPE phantom.

*Reported by:*  
*V. K. Bhatnagar (vivek@rrcat.gov.in)*

### N.7: Fire safety in RRCAT

Every year first-aid firefighting training to RRCAT employees, stipendiary trainees, TASAR apprentice, CISF staff members, and also for contract workers. This training is provided to develop skill for preliminary fire fighting and extinguishing of fire at initial stage itself. During the period July 2019 to June 2020, this training was imparted to 370 personnel which include 162 RRCAT staff members, 36 stipendiary trainees and 49 TASAR apprentice. Regular fire mock drills are conducted to develop alertness in firefighting staff. Eight fire mock drills were conducted during July 2019 to June 2020 at various locations in RRCAT. Fire safety contingency plan was prepared and vetted by DSP, Indore. Hindi translation of the same is being done.



*Firefighting training to RRCAT employees (top) and TASAR apprentices (bottom).*

*Reported by:*  
*V. K. Bhatnagar (vivek@rrcat.gov.in)*

### N.8: Clean and Green Campus activities in RRCAT

The Centre is continuously working to improve the cleanliness and increase the greenery in the campus by taking several initiatives with whole hearted participation of officials, in-campus school students, teachers and colony residents. This report describes recent activities in this direction.

*Facility for producing compost using bacteria:* In addition to vermicomposting technique, composting using microbial consortium i.e. bacteria culture (Bacillus, Halo Bacillus, Staphylococcus) is undertaken to process garden wastes. This facility is started with an expected capacity of ~ 25 MT/year of compost.



*Compost producing facility using bacteria.*

*Plantation campaigns:* Four plantation campaigns were carried out, during July-August in which colony residents, students and teachers of AECS, OCAL and HBNI, along with CISF staff actively participated. In these campaigns, around 1300 plants were planted, which included about 20 prominent local species, like Arjun, Bargad, Baheda, Jamun etc. The plantations done in previous years were maintained by watering with innovative approach of drip irrigation technique using energy efficient solar pumping system, especially useful in water scarcity conditions of peak summer.



*Recent plantation campaigns (left) and nurtured plants of the previous plantation drives (right).*



*Receiving Neem samplings from colony residents.*

A program was undertaken for awareness amongst school children and colony residents for raising of Neem saplings. Necessary guidance and materials (seeds, bags and manure) were provided for the purpose. This initiative got overwhelming response with nearly 700 saplings collected