

§7. Proposal of Safety Guidelines of Molten Salt Flibe Handling for Development of Tritium Breeding Blanket in Fusion Reactor

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Safety aspect for a force free helical reactor (FFHR), of which conceptual design have been studied with parallel to operation and experiment of a large helical device (LHD) has been investigated. Main safety features expected for the FFHR are, steady state plasma operation, no dangerous current disruption, and selection of Flibe blanket for tritium breeder, that is using molten salt compound made of LiF and BeF₂. The blanket has inherent safety features like low tritium inventory, self cooling effect and low chemical activity. Based on the classification of the plant systems and components, it is shown that large radioactivity including tritium release accident accompanied with the energy is avoidable. Fundamental safety of tritium processing would be secured by low tritium inventory, tritium dispersion to various component systems, and multiple protection systems. However Flibe is made of Beryllium compound, which is known as hazard material considering health of workers. To prevent to occupational chronic health hazard is major issues. Preliminary protection must be performed by safety handling technologies. In the present study, we propose fundamental safety requirements and safety guidelines considering Flibe handling in experiments and design of the Flibe processing systems. In the present safety consideration and countermeasures are shown assuming to treat in Japan under the Japanese regulation laws and refer to the US regulation laws. Safety guidelines for the Flibe handling and experiments include the following terms.

- (1) The limits of Beryllium dust in working place atmosphere and surface contamination are proposed based on the working area classification. The area is classified to three by color of Green, Yellow and Orange, as shown in Table 1 and Figure 1.
- (2) Lecture about safety, training and health check to protecting workers should be done strictly.
- (3) Sufficient working plan and safety analysis should be previously performed.

The first proposal is countermeasures for Flibe handling process and presumed events including effluent gas and liquid. The second is extraction of hazard potential, its protection systems and Beryllium

monitoring issues. Also the critical issues and emergency protecting systems assuming escalation to an event caused by accidental fracture of the experimental are concerned.

To do sufficiently safety analysis and planing, supervisor of safety management and experiment should be appointed. Then responsibility is also required.

- (4) Records of workers entrance, handling process and operation should be seriously memorized, which will be useful on event analysis.
- (5) Exhaust beryllium compound to environment must be decreased as low as possible. Also suitable exhaust gas and dust treatment system should be improved.

Table 1 Classification of beryllium handling area and entrance regulation

Classification	Airbone administration level	Protective management	Entrance Administration
Green	Environment and control room (<0.01 $\mu\text{g}/\text{m}^3$)	Clean area Allowed without protectors	Registrated workers free
Yellow	Working place (<0.2 $\mu\text{g}/\text{m}^3$)	Reusable working clothes, shoes and goves, etc. light protectors	No one is admitted without permitted persons
Orange	Working place (>0.2 $\mu\text{g}/\text{m}^3$)	Use special protective clothing Not reuse the protectors	As a general rule no one is admitted

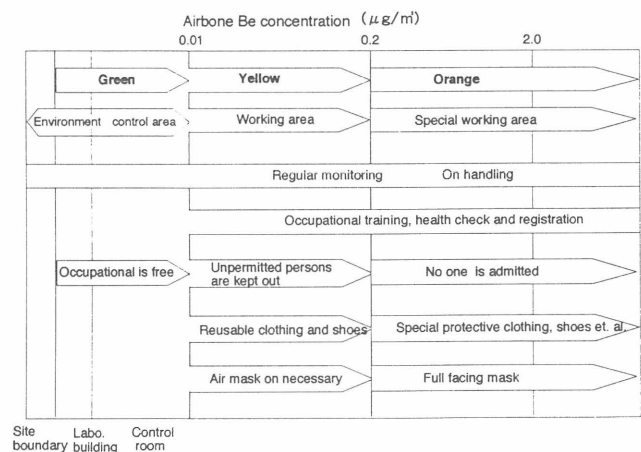


Figure 1 Beryllium handling and management rules.