

Development of Radiation Area Entrance Procedure of PEFP

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1. Introduction

Proton Engineering Frontier Project has been developing a 100 MeV proton linear accelerator.

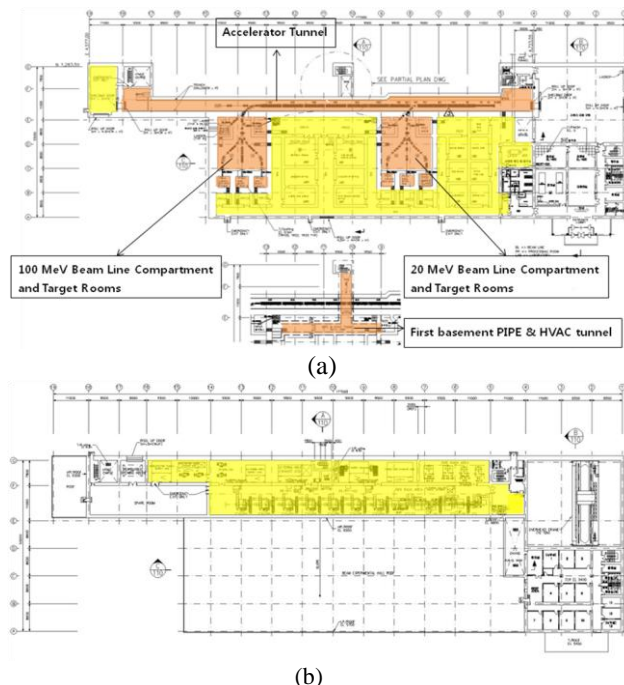
This paper describes the method and system used to control personnel accesses into hazardous areas at the Proton Accelerator Research Center of PEFP.

The Personnel Access Safety System(PASS) in the Proton Accelerator Research Center of PEFP protects personnel from radiation exposure hazards by controlling access to restricted areas and interrupting the machine operation in case unsafe conditions occur.

2. Personnel Access Safety System

2.1 Access control areas

In Proton Accelerator Research Center of PEFP, access control areas are divided into three types of access control areas (Fig. 1)



- High Radiation Area : Orange color
- Restricted Access Area : Yellow color
- General Public Area : Lack of color

Fig. 1. Radiation area of proton accelerator research center. (a) : First basement level and first floor, (b) : Second floor

Access control of each area must be achieved through the prior operating permit and associated access control items to gain accesses, as described in Table 1.

Table 1 access control area and access control items

Access Control Area	Radiation Level (RL : μ Sv)	Access Control Items
High Radiation Area	RL > 12.5	- POP - APD - MPK - IDC
Restricted Access Area	0.25 < RL \leq 12.5	- POP - APD - IDC
General Public Area	RL \leq 0.25	- IDC

- POP : Prior Operating Permit
- APD : Alarm Pocket Dosimeter
- MPK : Mechanical Personal Key
- IDC : ID Card

Different ID cards setup is required to get permissions according to the area classification. The ID card for high radiation area permits access to all three access control area and the ID card for restricted access area permits only access to restricted access area and general public area. The ID card for general public area permits access to general public area only.

For the protection against radiation exposure hazards, the personnel is required to get an alarm pocket dosimeter when accessing the high radiation area and restricted access area.

The mechanical personal keys are provided for personnel with prior access permit to high radiation area. Its function is to survey the number of personnel to the high radiation area and provide a condition for the opening and closing of the access door to the area.

2.2 Access modes

The access mode is designed to provide the four different access modes

• Free Access Mode :

The free access mode is applied only in special situations such as the initial installation of the accelerator equipments and test working. In this mode, beam is not extracted (no radiation) and the personnel

permit free access to the high radiation area, restricted access area, and general public area.

▪ **Controlled access mode:**

The controlled access mode allows only the personnel with prior access permission to enter and leave through their designated access door. In this mode of access, the opening/closing of the access doors operated by PASS is displayed and supervised on the PASS display in the main control room through the surveillance system.

▪ **No access mode:**

The no access mode prohibits access to the high radiation areas such as first basement PIPE & HVAC tunnel, accelerator tunnel, beam line compartment (20 Mev, 100 Mev), and each of the target rooms to be used in accordance with accelerator operation procedures. In this mode, beam is extracted.

▪ **Search mode:**

This procedure searches, in accordance with the procedures, for operating personnels who might be inside the high radiation areas to be used in order to prevent radiation hazards for all operating personnels before the operation of the accelerator.

2.3 Radiation Area Entrance Procedure

In order to control access to the radiation controlled area, the access control system is operated in accordance with the pre-established entrance sequence.

Firstly, in order to enter the radiation controlled area, the radiation worker must pass through the access doors as described in Fig. 2. Many instruments are installed at the access door to prove authority of the personnels. The APD system, in linkage with the IDC reader, reads the IDC and connects to PASS when APD is extracted/inserted so that the identity of the user that extracted/inserted APD and the number of the workers entered can be confirmed on the PASS display at the main control room. In addition, the Key Bank System, provided only to the operating personnels with prior permission to enter the high radiation area, is a system that connects with PASS in order to survey the number of access to the high radiation area and to provide conditions for the opening and closing of the access door to the area.

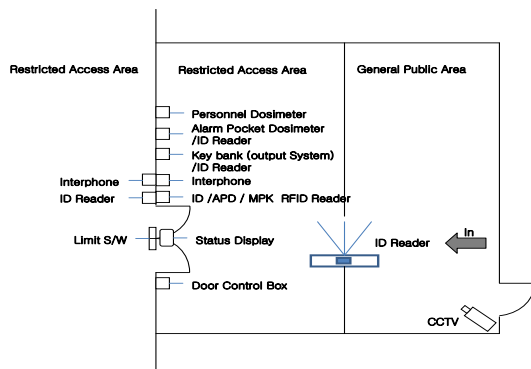


Fig. 2. Conceptual drawing of access control access door - 1

Secondly, in order to gain access to the high radiation areas such as the accelerator tunnel, beamline compartments (20 Mev, 100 Mev), and target rooms, the radiation workers must pass through the shielding door which is equipped with numerous access control devices as described in Fig. 3. The Key Bank System reads the IDC in connection with the IDC ard reader, and when a key is inserted/extracted, the system is linked to PASS so that the identity of the user that inserted/extracted the key and the number of access can be confirmed on the PASS display at the main control room. This system is a part of the open/close condition of the access door. The conditions for opening the access doors is as follows : the accelerator must be off, the radiation level must be lower than the set point, a key must be inserted that corresponds to a personnel with prior access permission, and the door open at the main control room after checking persons entering through CCTV. The access door remains open as long as the key is inserted. The access door closes when a key that corresponds to a personnel with prior access permission is extracted and the Close button pushed.

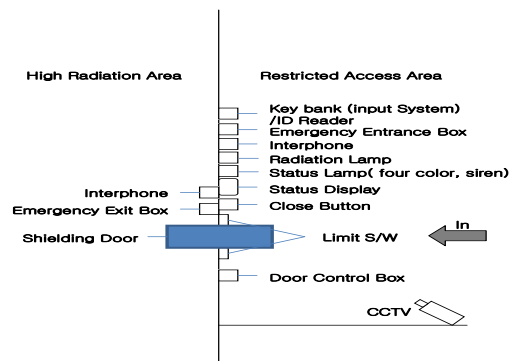


Fig. 3. Conceptual drawing of access control access door - 2

3. Conclusions

In this paper, we describe the method and system used to control personnel accesses into hazardous areas at the Proton Accelerator Research Center of PEFPP.

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