The Exhaust System Configuration of Controlled Area in the Proton Accelerator Research Center by Accelerator Operation Mode

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1. Introduction

Since host site host site was selected Gyeong-ju city in January, 2006. we need design revision of Proton Accelerator research center to reflect on host site characteristics and several conditions. Also the IAC recommended maximization of space utilization and construction cost saving. After GA(General Arrangement) is made a decision, it is necessary to evaluate the radiation analysis of every controlled area in the proton accelerator research center such as accelerator tunnel, Klystron gallery, beam experimental hall, target rooms and ion beam application building to keep dose rate below the ALARA(As Low As Reasonably achievable) objective. Our staff has reviewed and made a shielding design of them.

In this paper, According to accelerator operation mode and access conditions based on radiation analysis and shielding design, we made the exhaust system configuration of controlled area in the proton accelerator research center. Also, It will be made use of PSIS design and configuration for entrance control mode.

2. Targer room operation scenario & access mode

In proton accelerator research center, beams are extracted to two lines for 20/100MeV and each beam lines have 5 target rooms as shown in Fig 1. According to beam current, target materials, beam irradiation time and operation scenario, each target room has its own operation and access mode as follows :

- 20MeV and 100MeV beam utilities are not allowed to operate simultaneously.
- In 20MeV beam extraction operation
  - TR 21 and TR 25 can not operate at the same time.
  - When TR 21 or TR 25 is in operation, TR 22, TR23 or TR 24 has exclusive operation modes.
  - After beam shut down, workers can be to access to every 20MeV target rooms at once.
- In 100MeV beam extraction operation
  - TR 101 and TR 105 can't operate at the same time.
  - When TR 101 or TR 105 is in operation, TR 102, TR103 and TR 104 are not able to operate simultaneously.
  - After beam shut down, people are allowed to access to TR102, TR103 and TR104. one of the 100MeV beams being in operation, TR101, TR105 and 100MeV beamline enclosure can not be access to anyone.

Fig. 1 20/100MeV Target room configuration of PEFP

3. The exhaust system of controlled area

3.1 Accelerator tunnel area

According to target room operation scenario and access mode, the whole air of this area should be recirculated without any air inflow from outside during accelerator operation. As shown in Fig. 1, a part of it is exhausted through ACU(Air Cleaning Unit) installed in the klystron gallery area to remain under slightly negative pressures with respect to outside and adjacent areas. When accelerator shut down, air from outside flows in the accelerator tunnel for ventilation. In this time, the whole air of accelerator tunnel should pass through accelerator tunnel ACU and collected in the exhaust air mixing box for air dilution.

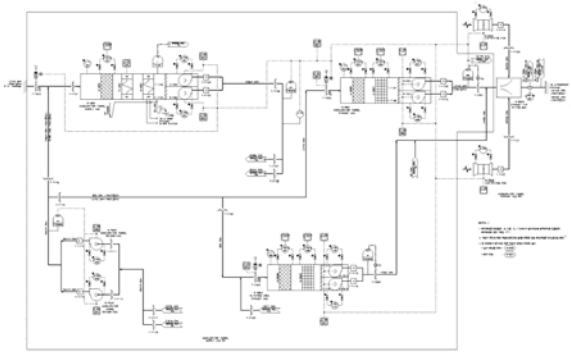


Fig. 2 HVAC system configuration of Accelerator Tunnel and Klystron gallery

3.2 Klystron gallery area

HVAC for the klystron gallery area operate at any time and a part of air released from this area recirculate. ACU for this area exhaust the air continuously to remain under slightly negative pressures with respect to outside and adjacent areas. The whole air passing through exhaust ACU should be diluted and then released outside to keep discharge control standard as shown in Fig 2.

3.3 Target room area

HVAC installed in this area is operated only in use. the air released from this area should not deflate to outside until it is diluted to meet the requirement of Discharge Control standard. As shown in Fig 3. Dual supply and exhaust valves are designed to enhance safety of HVAC system.

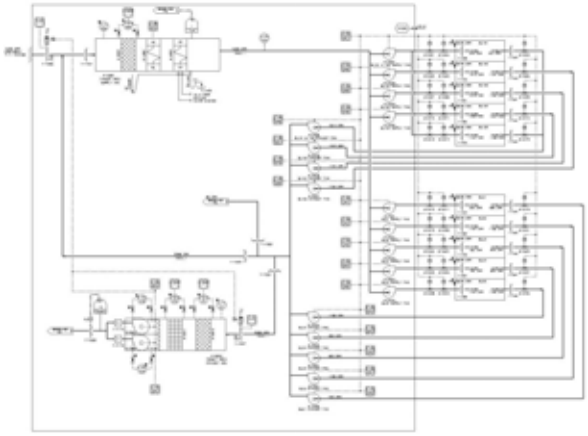
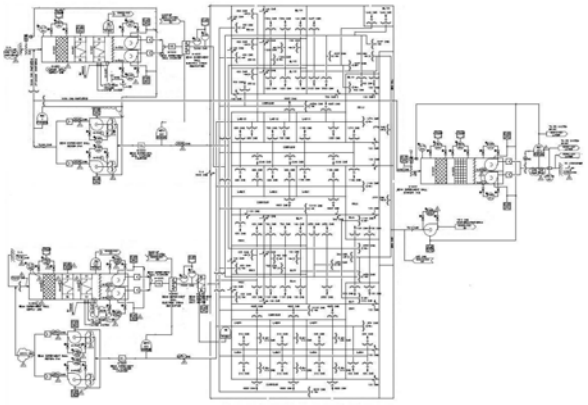


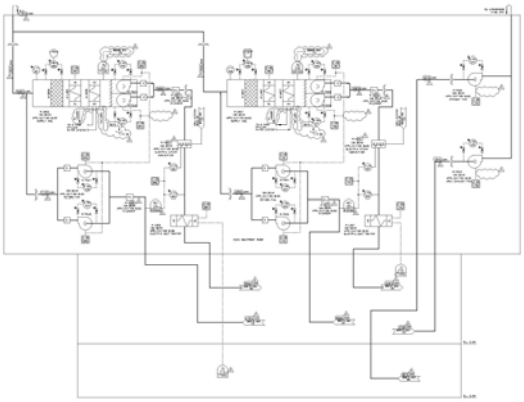
Fig. 3 HVAC system configuration of target rooms.

3.4 Beam experimental hall area and Ion beam application building

The exhaust fan installed in these area is operated in continuously forced-exhaust only for ventilation. Fig 4 presented this operation mode and configuration in detail.



(a)



(b)

Fig. 4 HVAC system configuration of beam experimental hall(a) and Ion beam application building(b).

4. Conclusion

After GA(General Arrangement) is made a decision, It is necessary to evaluate the radiation analysis of every controlled area in the proton accelerator research center such as accelerator tunnel, Klystron gallery, beam experimental hall, target rooms and ion beam application building to keep dose rate below the ALARA(As Low As Reasonably achievable) objective. Our staff has reviewed and made a shielding design of them. In this paper, According to accelerator operation mode and access conditions based on radiation analysis and shielding design, we made the exhaust system configuration of controlled area in the proton accelerator research center. Also, It will be made use of PSIS design and configuration for entrance control mode.

5. Acknowledgments

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