

## Electrical Ground System Design of PEFP

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### 1. Introduction

Since 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.

In this paper, electrical grounding and lightning protection design scheme is introduced. In electrical grounding system design of PEFP, we classified electrical facilities into 4 groups; equipment grounding (type A), instrument grounding (Type A), high frequency instrument grounding (Type C) and lightning arrestor grounding (Type D).

Lightning protection system is designed in all buildings of proton accelerator research center of PEFP, including switchyard.

### 2. Electrical Grounding & Lightning System for the Proton Accelerator Research Center of PEFP

Electrical grounding and lightning protection system is to protect personnel and equipment from dangerous voltage caused by lightning and grounding accident, to confirm the operation of a protection relay isolating faulted equipment from a system and to make stable a line voltage to a ground [1].

#### 2.1 Grounding System Design of PEFP

Grounding mesh in proton accelerator research center of PEFP is designed in accordance to IEEE 142 and grounding resistivity should be limited in 1~5 ohm. Fig. 1 describes grounding mesh in PEFP.

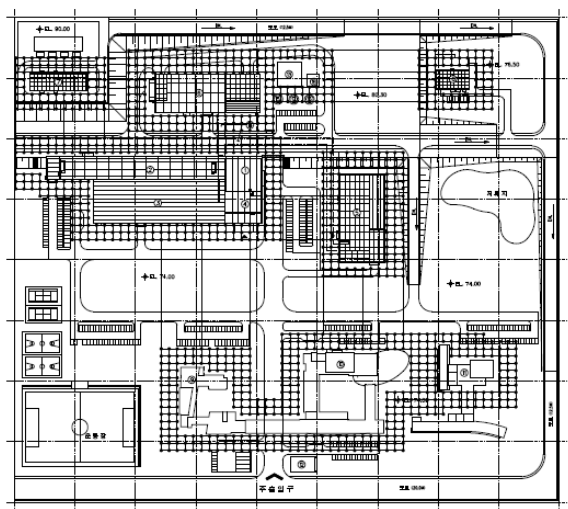


Fig. 1 Electrical grounding mesh in PEFP.

For the electrical ground system design of PEFP, we classified electrical facilities into 4 groups; equipment grounding (type A), instrument grounding (Type A), high frequency instrument grounding (Type C) and lightning arrestor grounding (Type D).

For the general equipment grounding, grounding system for indoor/outdoor is designed. For the outdoor grounding system, main mesh is utilized. For the indoor facilities in tunnel, transformer, cable tray, panel enclosure, etc., common ground is required.

For the instrument grounding, we adopted separate ground. Instruments for the proton accelerator research center are; low frequency instruments grounding, computer system grounding, cable shield grounding for the high voltage cable, signal/shield cable, digital output signal cable. For the high frequency grounding, we adopted separate ground. High frequency instruments in Proton Accelerator Research Center are: ion beam implanters in ion beam application building and klystrons in accelerator & beam application research building.

For the lightning arrestor grounding, we adopted separate ground. Table 1 summarized grounding requirements for the Proton Accelerator Research Center of PEFP.

In Fig. 2 and Fig. 3, grounding system design of Accelerator & Beam Application Research Building and Ion Beam Application is described. As shown in Fig. 2 and Fig. 3, grounding pigtail is installed in grounding mesh to connect all electrical equipment. Specifications of grounding cable, such as size and length, were selected considering expected grounding fault current of each facilities.

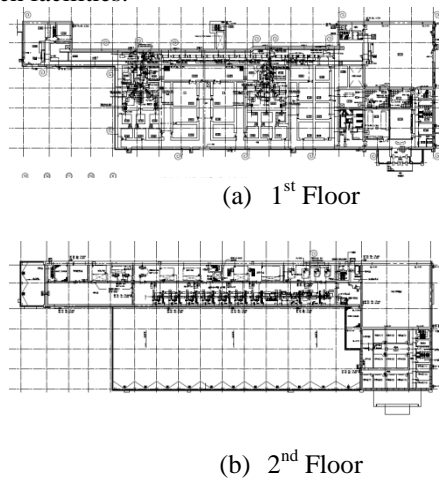
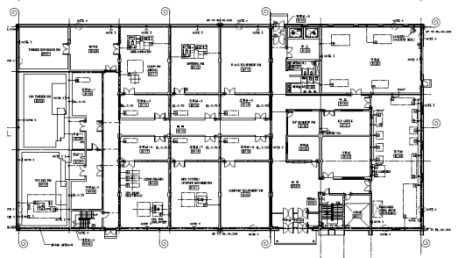
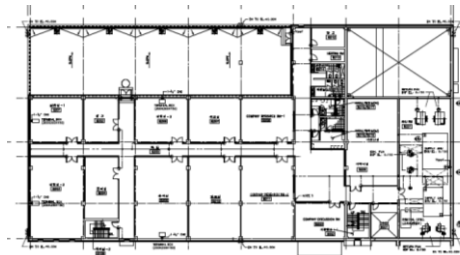


Fig. 2 Grounding system design of Accelerator & Beam Application Research Building



(a) 1<sup>st</sup> Floor



(b) 2<sup>nd</sup> Floor

Fig. 3 Grounding system design of Ion Beam Application Building

Table 1 electrical ground system design of PEFP.

Building	Facilities to ground	Grounding Type
Accelerator Tunnel	Tunnel, Tray Electrical Facilities	Type A
	RFQ, DTL, MEBT	Type C (separate ground)
Beam Experiment Hall	TL, BL-Normal, BL-High	Type C (separate ground)
Klystron Gallery Area	VCB, SCR/PLC controller, HVS, Modulation anode power supply, transformer/rectifier, filter	Type A
	Klystron	Type C (separate ground)
Ion Beam Application Building	Ion beam implanter (8 ea)	Type C (separate ground)

## 2.2 Lightning Protection System Design of PEFP

Lightning protection system is designed in all buildings of proton accelerator research center of PEFP, including switchyard. Protection angle of an air terminal installed in protected things which are containing gunpower, combustible liquid or combustible gas is set to 45 degree. For the buildings of their height are taller than 20m, air terminal should be installed according to the Korean Building Act. Fig. 4 describes lightning protection system of Accelerator & Beam Application Research Building of PEFP.

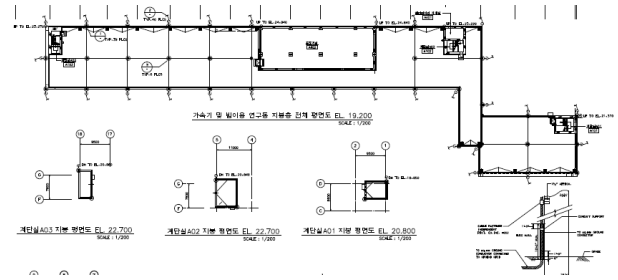


Fig. 4 Lightning Protection System of Accelerator & Beam Application Research Building of PEFP.

## 3. Conclusions

In this paper, to protect personnel and equipment from dangerous voltage caused by lightning and grounding accident, electrical grounding and lightning protection design scheme is introduced.

In electrical grounding system design of PEFP, we classified electrical facilities into 4 groups; equipment grounding (type A), instrument grounding (Type A), high frequency instrument grounding (Type C) and lightning arrestor grounding (Type D).

Lightning protection system is designed in all buildings of proton accelerator research center of PEFP, including switchyard.

## 4. Acknowledgments

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## REFERENCES

- [1] PEFP, KOPEC, "Comprehensive Design Report", 2005. 6