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# The Basic Design of Proton Accelerator Conventional Facilities

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## 1. Introduction

The Proton Engineering Frontier Project (PEFP), approved and launched by the Korean government in July 2002, consist of a 100 MeV proton linear accelerator development and programs for its utilization and application. According to PEFP, expected to complete in March 2012, proton accelerator research center will be founded on the project host site where Korean government will select.

In this paper, we will describe the conceptual & basic design for conventional facilities such as General Arrangement(GA) and conventional facility system. Based on the conceptual & basic design, we will make detail design for Conventional Facility considering site-independent conditions.

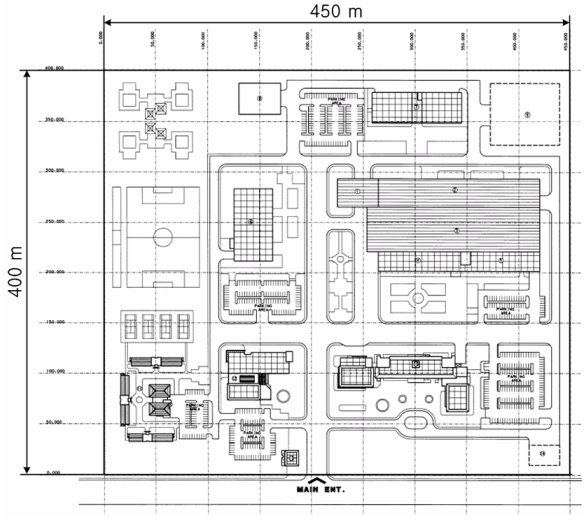
## 2. Basic Design of Conventional Facility for the Proton Accelerator

### *2.1 General Arrangement*

An approximately 180,000m$^2$ of evenly graded site was assumed as a potential area which can accommodate the required buildings and space such as the Accelerator & Beam Application Building and Ion Beam Application Building. Also, we should design the utility facilities such as utility building, power receiving facility and cooling tower to ensure highest level of service to Accelerator & Beam Application Building and related facilities. Conventional facility site layout is shown in Fig. 1

Accelerator & Beam Application Building, as shown in Figure 2, consists of the Accelerator Tunnel, Klystron Gallery Area, Accelerator Assembly Area, Accelerator

Fig. 1 Conventional facility site layout



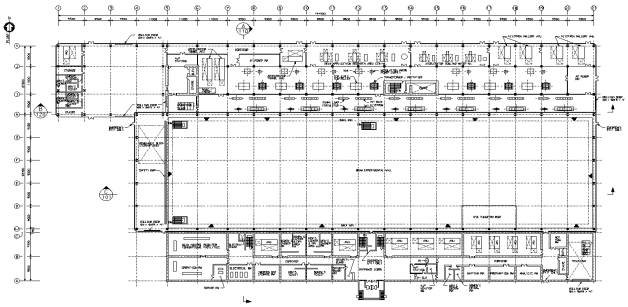



Fig. 2 Accelerator & Beam Application Building plan

Control Area, Beam Experiment Hall and Beam Application Research Area. The Accelerator tunnel is made up of an underground reinforced concrete structure. It is a space for installing LINAC Structures such as Accelerator, RFQ, DTL, etc. The Klystron Gallery Area is a space for installing power supply equipment and Klystron which is used to supply high-frequency resources to the Accelerator. Accelerator Assembly Area consists of a ground steel-frame structure adjacent to the Klystron Gallery Area. It is necessary space for assembling the Accelerator. Therefore, this area should be designed to be kept in a clean condition. The Accelerator Control Area consists of a reinforced concrete structure with two stories above ground, which is adjacent to the Beam Experiment Hall and Beam Application Research Area. It is a space for accommodating the related devices necessary for operating the Accelerator, and is to be furnished with equipment and facilities essential for operating the Accelerator. This area should be designed to be kept in a clean condition. The Beam Experiment Hall which has the basements and ground floors of the building consist of reinforced concrete structures and steel-frame structures, respectively. It is a space for installing and operating the equipment using 20MeV/100MeV energy beam generated from the Accelerator. A beam transportation line from the Accelerator is shielded by removable walls and is designed to transport energy beam to the Beam Experiment Hall. It is also considered the shielding and arrangement of Beam Experiment Hall for the sake of safety against the radioactivity. Especially, the design for spatial arrangement is taken into consideration to make vehicles for the use of maintenance come in and out.

The Ion Beam Application Building, as shown in Figure 3, consists of a reinforced concrete structure adjacent to the Beam Experiment Hall and Accelerator Control Area. It is a space for researchers to reside who operate the equipment using 20MeV/100MeV

energy beam generated from the Accelerator, and is divided into radiation control areas and non-radiation control areas. Access control facilities, which give access to Beam Experiment Hall, are considered and the equipment hatch used for the purpose of carrying in related equipment.

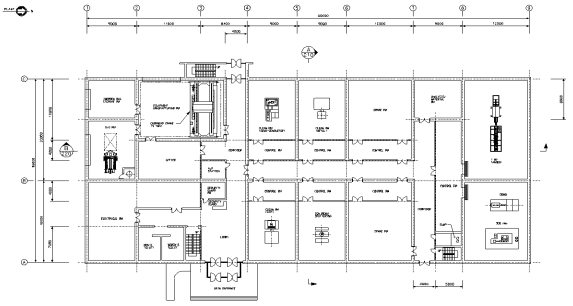


Fig. 3 Ion Beam Application Building plan

The Utility Building consists of a reinforced concrete structure with a single story above ground. It is a space for installing and operating the facilities which supply utilities in the central supplying type, such as a Heating, Ventilating and Air- Conditioning system, demineralized water, compressed
air and so on, necessary for operating the Accelerator and Beam Experiment Hall and incidental facilities. The Utility Building is a non-radiation control area, and the equipment hatch has been considered for the purpose of carrying in related equipment.

*2.2 Conventional Facility System Design*

Conventional facilities system design consists of 154kV Substation Facility System, Power Distribution System, Control and Monitoring System, demineralized cooling water system and Heating, Ventilating and Air Conditioning (HVAC) system.

The 154kV substation facility system, as shown in Figure 4, receives power through the one 154kV overhead transmission line from KEPCO's 154kV substation, which is located near the proton accelerator facility and supplies electrical power to the proton accelerator facility via 154/3.3kV step-down transformers.

The power distribution system, as shown in Figure 5, consists of 3.3kV switchgear system for RF power supply system(A system) and Conventional Facility(B system), 480V & 220V load center system, 480V motor control centers(MCC) system and emergency power system.

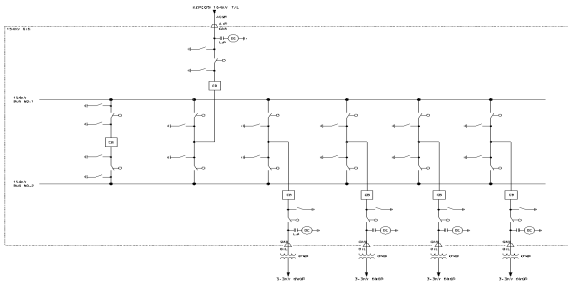


Fig. 4 154kV Substation Facility System

The Control & Monitoring System(CS) is designed to provide the operator to monitor and control the process system safely and reliably in all operating modes. The CS performs the protective function to protect the operator during abnormal operation and accident with PSIS and Access Control System,

The Demineralized Water System (DW) removes the electrolyte, organic compound, etc. from tap water which is supplied from the process storage tank and stores the processed demineralized water in demineralized water storage tank.

HVAC system is introduced to the Accelerator building, Beam Application Building, Administration Building and Miscellaneous Building. Its aim is to maintain suitable environmental conditions for personnel and operation of equipment, controls and instrumentation.

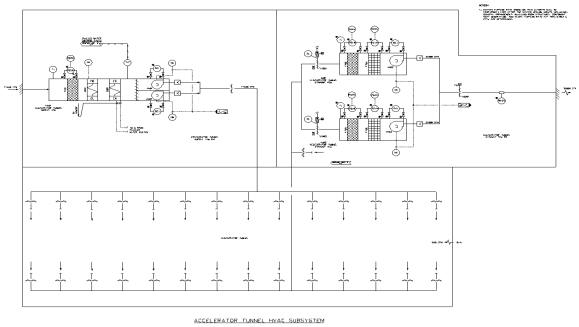


Fig. 5 HVAC system P& ID of Accelerator and beam application research area

## 3. Conclusion

In this paper, we described the conceptual & basic design for conventional facilities such as General Arrangement(GA) for the Accelerator & Beam Application Building, Ion Beam Application Building and Utility Building and conventional facility system. Based on the conceptual & basic design, we will make detail design for Conventional Facility considering site-independent conditions.

## ACKNOWLEDGEMENT

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## REFERENCES

[1] B. H. Choi, "Status of the Proton Engineering Frontier Project", proceeding of PAC, 2005
[2] PEFP, KOPEC, "Comprehensive Design Report", 2005