Electric Power System Design for the Support Facilities of Proton Accelerator Research Center of PEFP

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1. Introduction

PEFP (Proton Engineering Frontier Project) is scheduled to administrate the conventional facilities design with Gyeong-Ju and complement its unfit points. When construction work starts according to the construction schedule, a field work office will be installed to supervise Proton Accelerator Conventional Facilities Construction.

In 2008, we executed the support system design works of PEFP with Heerim CO. We also established exterior design concept for all buildings in the Proton Accelerator Research Center of PEFP.

In this paper, we will describe electric power system architectures for the support System of the proton accelerator research center in PEFP, such as 3.3kV electric power distribution facilities with 4 transformers, emergency power system, lighting & heating system, automatic control system for electric power & lighting system and motor control system.

2. Electrical Facilities Design for the Support System of Proton Accelerator Research Center

In this paper, electrical facilities design for the support system of Proton Accelerator Research Center [1] is described. In electrical facilities design procedures, we will describe 3.3kV electric power distribution system, emergency power system, lighting & heating system, automatic control system for electric power & lighting system and motor control system.

2.1 Electric Power Supply System

In electric power supply system design for the support system of proton accelerator research center, we classified electric load into 3 groups; lighting & heating load, heating/air conditioning load and ice bon load. Fig. 1 describes single line diagram for the support facilities of PEFP.

Electric power is supplied from power supply facilities for the support facilities in the electrical room in Administration Building. As shown in Fig. 1, electric power supply system for the support facilities are composed of transformers, circuit breakers and distribution panels. Relays for the high voltage protection are UVR, OCR, OCGR, while relays for the low voltage protection are OCR (ACB installed Type). Batteries are installed for CB/relay operation and supplying DC power.

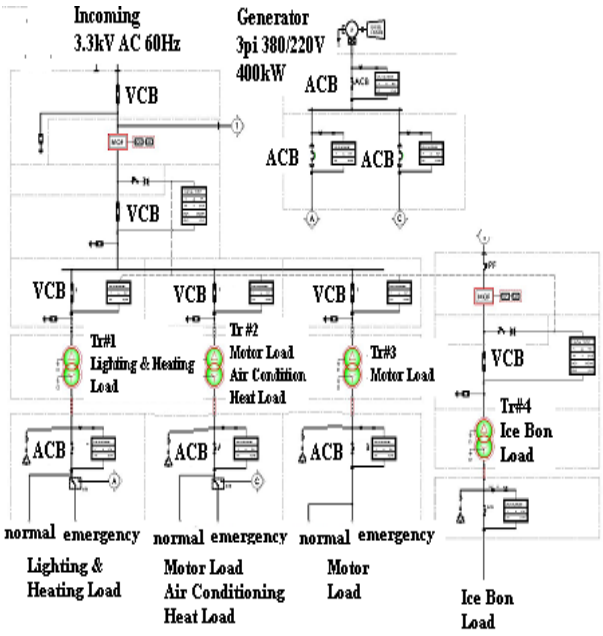

Fig. 1. Single Line Diagram for the Support Facilities of PEFP

2.2 Emergency Power System

If electric power from the transformer is lost, emergency power system supplies electric power to the critical load such as emergency light system, fire protection system, elevator, etc. We adopted 3 Ø 4W, 380/220V, 400kW diesel engine as a generator for the emergency power system of support facilities of PEFP.

2.3 Lighting System

Lighting system provides sufficient illumination in each area of the building. Table I describes lighting fixtures for each room type and its illumination intensity.

2.4 Automatic Control Facilities for the Electric Power & Lighting System

In support facilities of PEFP, Automatic Control Facilities for the Electric Power & Lighting System are constructed. Automatic Control Facilities for the Electric Power & Lighting System also reduce energy consumption. Fig. 2 describes Automatic Control Facilities for the Electric Power & Lighting System for the support facilities of PEFP.

Table I: Illumination intensity and lighting fixture for each room type

room type	Illumination (lx)	Lighting Fixture Type	remark
Elec./Mech. RM	150 300	· Raceway Attached FL 2/32W	Administration BLDG
Office	300 600	· Raceway Fluorescent FL 2/32W	Administration BLDG Regional Cooperation BLDG
Conference RM	150 400	· Raceway Fluorescent FL2/32W, Halogen Downright	Administration BLDG
Audio/Visual RM	150 400	· Raceway Fluorescent FL 2/32W	Regional Cooperation BLDG
Stair	60 150	· Fluorescent Attached FL 2/32W	All
entrance, Hall	150 300	· Recessed Fluorescent FUL 2/18W	〃
dormitory	100~150	· Recessed Fluorescent FL 2/32W	Dormitory Building

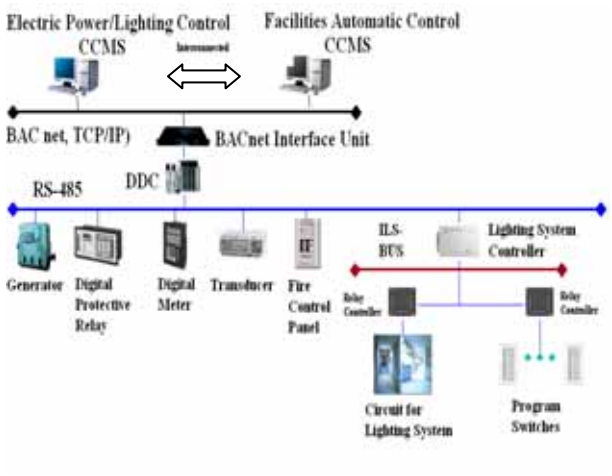

Fig. 2. Automatic Control Facilities for the Electric Power & Lighting System for the support facilities of PEFP

As shown in Fig. 2, Automatic Control Facilities for the Electric Power composed of central control device, digital disposal controller (DDC) and local control devices.

Lighting control system supervises/controls lighting facilities in the support facilities. It consists of central control device, lighting control panel and local control devices.

2.5 Motor Control Facilities

In motor load facilities design procedures of the support facilities, we firstly check the motor load amount and set up the capacities of circuit breaker and cables. Table II describes motor starting mode according to the motor capacity.

Table II: Motor Starting Mode For Each Motor Capacity

Motor Capacity	Motor Starting Mode
below 20HP	Direct On-Line
above 20HP and below 75HP	Y-Δ
above 75HP	reactor

2.6 Lightning & Grounding Protection System

The aim of lighting and grounding protection system is to protect personnel and equipments from dangerous voltage caused by lightning and grounding accident.

For the lightning protection design, protection angle of an air terminal of the lightning protection system is set to 45 degree.

For the grounding system of PEFP, grounding mesh in proton accelerator is designed to connect all electrical equipments.

3. Conclusions

In this paper, we describe electric power system architectures for the support System of the proton accelerator research center in PEFP, such as 3.3kV electric power distribution facilities with 4 transformers, emergency power system, lighting & heating system, automatic control system for electric power & lighting system and motor control system.

Acknowledgements

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REFERENCES

[1] Detail Design Report for the Support Facilities of Proton Accelerator Research Center of PEFP, Heerim CO., 2008. 11.