

## Acceleration Amplification Effect Due to the Dynamic Characteristics of Electric Panel

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### 1. Introduction

Most of the electric panels which are essential to the operation of the basic facilities, are installed on the access floor and have a various dynamic characteristics according to the shape, mass and stiffness of electric panel. Then, the acceleration amplification effect of electric panel is come out diversely due to those factors. The expectation of acceleration amplification effect is very important to evaluate the seismic safety of electric panel because the seismic load which is raised by the acceleration amplification effect, has a large influence on the supporting structure of electric panel such as access floor.

Therefore, the acceleration amplification effect is examined according to the various dynamic characteristics of electric panels through the shaking table test in this study.

### 2. Test Conditions

#### 2.1 Electric Panel

Two types of electric panels which are commonly used in the industrial field, are used to analyze the acceleration amplification effect by various dynamic characteristics of electric panels. Also, electric panels are installed on the access floor to consider the installation condition of the real site. In order to analyze the dynamic characteristics of the electric panels, impact hammer test is adopted. Table 1 shows the structural and dynamic characteristics and Fig. 1 shows the electric panels.

Table 1. Structural & dynamic characteristics of electric panels

Electric panel	Dimension [W×D×H] (cm)	Weight (kN)	Natural frequency (Hz)	
			X axis	Y axis
No. 1	90×57×235	6.0	15.5	5.5
No. 2	80×73×235	7.9	20.5	19.5

#### 2.2 Acceleration Measurement

In order to measure the accelerations which occur during the shaking table test, 3-directional accelerometers are installed at shaking table, access floor, and electric panel as shown in Fig. 2.

It is used that the enveloped response spectrum which can envelope every floor response spectrum generated at each floor in building as input motion for shaking

table test because most of the electric panels are installed at several floors in building.



(a) No. 1 (b) No. 2

Fig. 1. Electric panels



Fig. 2. The measuring points of acceleration

Fig. 3 shows the shaking table motions and 6-DOF shaking table is used in this study.

### 3. Shaking Table Test

Fig. 4 shows the acceleration response spectrum which was got through the shaking table tests. PNL 1 and 2 indicates to electric panel 1 and 2 and P, A, T indicates to the measuring points of acceleration in Fig. 4. P means the center of electric panel and A means the access floor and T means the shaking table as shown in Fig. 2.

Electric panel 1 shows larger acceleration amplification than electric panel 2 under same shaking table motions as shown in Fig. 4. The reason is that electric panel 1 has more flexible dynamic characteristics than electric panel 2 in horizontal direction. Due to the acceleration amplification effect, even though the weight of electric panel 1 is smaller than the electric panel 2, electric panel 1 has larger

influence on the supporting system such as anchorage and member of access floor than the electric panel 2. Also, electric panel 1 shows heavier vibration than electric panel 2 during the shaking table test.

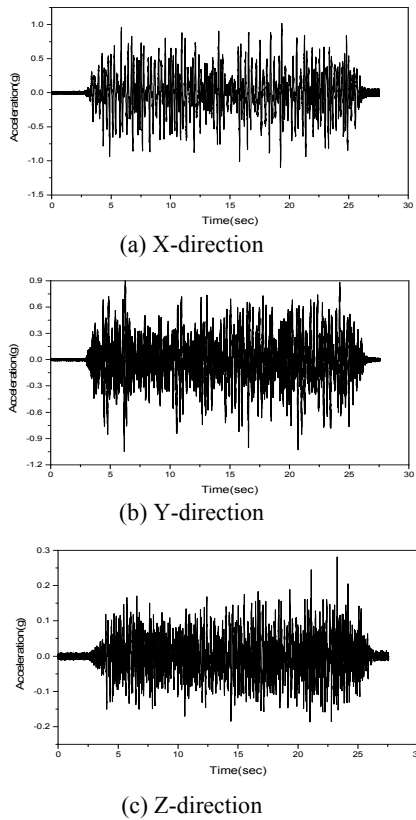


Fig.3. Shaking table motions

However, in case of vertical Z direction, acceleration amplification in both electric panel 1 and 2 is almost same because vertical dynamic characteristics of both electric panel 1 and 2 are almost same.

#### 4. Conclusions

The acceleration amplification effect is examined according to the various dynamic characteristics of electric panels through the shaking table test in this study.

Electric panel 1 shows larger acceleration amplification than electric panel 2 under same shaking table motions. The reason is that electric panel 1 has more flexible dynamic characteristics than electric panel 2 in horizontal direction. However, in case of vertical Z direction, acceleration amplification in both electric panel 1 and 2 is almost same because vertical dynamic characteristics of both electric panel 1 and 2 are almost same.

After all, large acceleration amplification has a larger influence on the supporting system such as anchorage and member of access floor and is directly related to the seismic safety of electric panel. Therefore, the exact expectation of acceleration amplification effect is necessary to evaluate the seismic safety of electric panel.

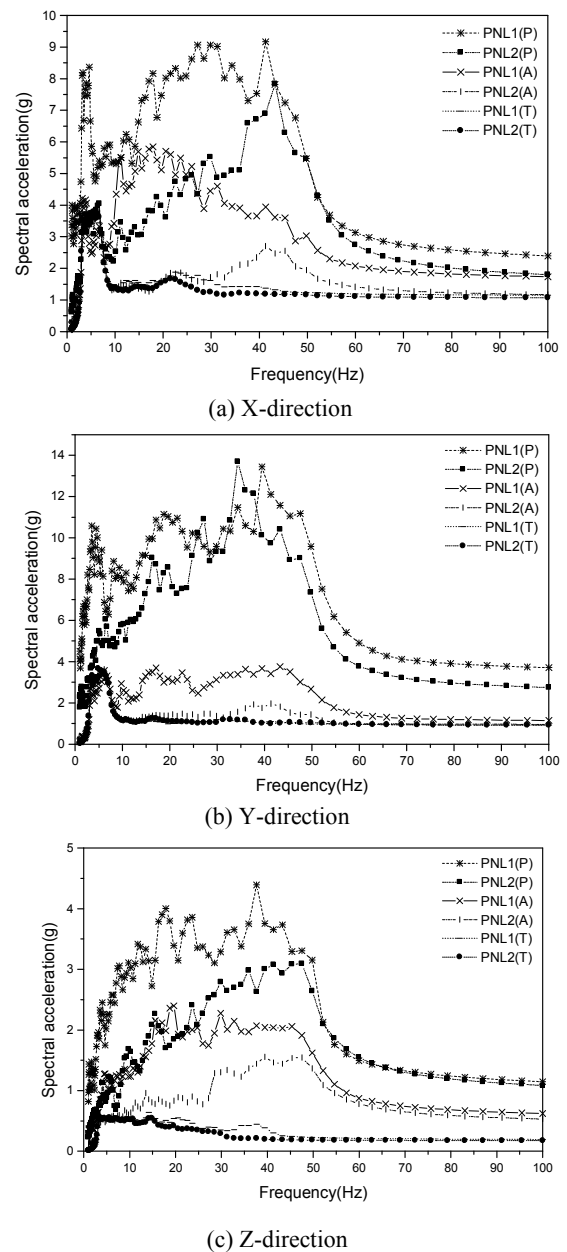


Fig. 4. Acceleration response spectrum

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