

Database System for Aging Deteriorated Equipment of Operating Nuclear Power Plants

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1. Introduction

Aging deteriorations such as crack, steel corrosion, and decrease of anchor tightness are found at old operating nuclear power plants. Those aging deteriorations are being occurred gradually at the nuclear power equipment as operating period of nuclear power plant is increased. In order to consider aging deteriorations to safety assessment of nuclear power plant, history management of aging deteriorations is the most important but has not been well managed.

Therefore, seismic walkdown is performed to investigate the aging deteriorations intended for the old operating nuclear power equipment and database system is established to manage effectively aging deterioration data collected through seismic walkdown in this study.

2. Aging Deterioration

2.1 Investigated Equipment

The investigated equipment is the mechanical and electrical equipment needed to achieve and maintain safe shutdown conditions in a nuclear power plant during and after safe shutdown earthquake. The No. of the investigated equipment is 378 at K-nuclear power plant and 152 at W-nuclear power plant.

2.2 Aging Deterioration

When the seismic walkdown is performed at nuclear power plant, the concerned aging deteriorations are as follows,

- Crack
- Steel corrosion
- Concrete compressive strength
- Anchor tightness

The above aging deteriorations have large influence on the seismic safety of equipment.

2.3 Investigated Methods

In order to investigate the aging deterioration of equipment, Seismic Review Team (SRT) is organized and at least one Seismic Capability Engineer (SCE) joined SRT. The SCE should be degreed engineer, or equivalent, who has completed a SQUG (Seismic Qualification Utility Group) – developed training course on seismic adequacy verification of nuclear power plant equipment. This engineer should have experience (at least five years) in earthquake engineering applicable to nuclear power plants and in structural or mechanical engineering.

In order to inspect the aging deterioration, several non-destructive methods are adopted. Crack microscope is used to inspect the crack width and schmidt hammer for concrete compressive strength, vernier calipers for steel corrosion, and torque wrench for tightness of anchor.



(a) Crack Width



(b) Steel Corrosion



(c) Concrete Compressive Strength



(d) Anchor Tightness

Figure 1. Inspection of Aging Deteriorations

2.4 Investigated Results

In case of crack, it is found at 8 equipment at K-nuclear power plant and 30 equipment at W-nuclear power plant as shown in figure 2.



Figure 2. Crack at Control Panel

Several steel corrosions are found at equipment but they don't have a large influence to the seismic performance of equipment. Also, average concrete compressive strength is 292 kgf/cm² at K-nuclear power plant and 316 kgf/cm² at W-nuclear power plant. They show larger than design concrete compressive strength.

At last, average anchor tightness is more than 2.0 kgf-m and this result satisfies tightness criteria of SQUG GIP.

3. Database System

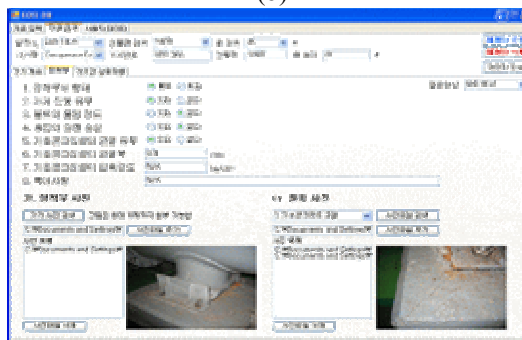
Database system is established to manage effectively the aging deterioration data collected through the seismic walkdown. The database system can input the many features and photographs such as anchorage, interaction between equipment in addition to aging deteriorations. Also, the user can access easily to necessary data of database system using search function. The key words, which can search the data, are nuclear power plant, building, floor elevation, and aging deteriorations.



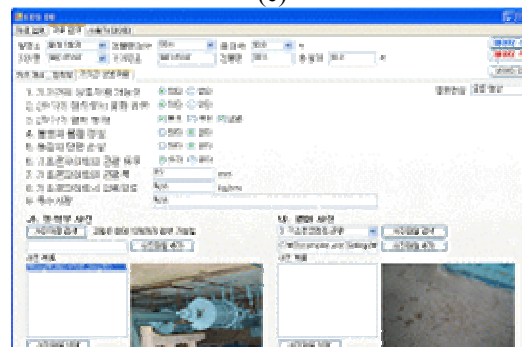
(a)



(b)



(c)



(d)

Figure 3. EDS Database System

4. Conclusion

Seismic walkdown is performed to investigate the aging deteriorations intended for the old operating nuclear power equipment and database system is established to manage effectively aging deterioration data collected through seismic walkdown in this study.

The database system is made considering the user convenience and includes many information of 530 equipment including aging deteriorations.

The database system will contribute the maintenance and safety improvement of the operating nuclear power plant.

REFERENCES

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