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The Study of mechanical and electronic installation requirements based on passive defense approach (Case study: Tabriz Central Library)

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Abstract

Passive defense is defined as a series of measures in order to reduce civilian population, installation and structures vulnerability against explosive loading and probable threats. Hazardous installations can lead to secondary explosions and threats (Iran's National Building Regulations Office, 2013). In addition, temporary and permanent deficiencies can stop our activities. In this study, in the first place, electronic and mechanical installation requirements in passive defense are introduced. Then, the amount of these requirements observance is investigated at Tabriz Central Library as one of the most important structures located in Tabriz. The results indicate that the passive defense requirements are not obeyed at Tabriz Central University. Therefore, the clientele, staff and documents are in danger of damage and destruction.

Keywords: Passive defense, Tabriz Central Library, electronic and mechanical installation requirements, vulnerability

Introduction

Civilian population, blast proof or resistant installation and structures, and versatile performance of structures are the main purposes of passive defense (Iran's National Building Regulations Office, 2013). To achieve these goals, professional site selection, optimum and exact design of electronic and mechanical installation are among the most important issues in reduction of adversary, terrorism and natural disasters. In 1975, the Case Western Reserve University Library, Cleveland, Ohio was flooded. Almost 40,000 books and 50,000 maps became wet and muddy and the cost of recovery was $540,000. Floods struck in Prague city of Czech Republic in August 2002, destroyed and damaged large collections in more than 40 libraries including 14 major research libraries and the National Library of the Czech Republic and the Prague Municipal Library. More than 8.00.000 documents were damaged or destroyed. Damage to the National library was estimated at $11,000,000 whereas for Prague Municipal Library it was $15.00.000 (Zaveri, 2014). The most featured principles in passive defense are location, concealment, deception, camouflage, covering, separation and dispersion, fortification, altering service (Movahhedinia, 2010).

The observance of the mentioned principles are the most sustainable ones in passive defense in civil engineering, architecture and urban planning domains which can facilitate crisis management, control the various parts connection and lead to system serviceability, operation continuity, the reduction of structure and civilian population vulnerability.

One of the most important parts of passive defense in civil engineering, architecture and urban planning domains is electronic and mechanical installation domain which can categorize into hazardous and low-risk ones. Hazardous installations are those which can result in secondary threats. However, low-risk installations destruction can only lead to the optimized performance and effectiveness.

In public centers such as shopping trades, schools, hospitals, universities and so on, ventilation, lightning, communication, fire extinguishing and alarm system, firefighting system, and similar installations play a key role in these centers sustainability and serviceability. Despite of ineffectiveness and dysfunctional operation, neglecting passive defense requirements particularly in electronic and mechanical installations, can lead to adversary abuse and destruction. Therefore, these principles observance has a great importance in a center's functionality and serviceability in crisis condition.

Tabriz Central Library (T.C.L) is the oldest public library in East Azarbayjan province after Tarbiyat Library. From the prospective of reference books, manuscripts, and clientele, T.C.L is among the largest and richest public libraries in Iran. In this study, passive defense requirements in electronic and mechanical installation domain in T.C.L are investigated. Besides of experts' experiences, field observations, books and published papers are used to fulfill this study. This paper is seeking to evaluate the passive defense installation requirements in T.C.L (Islamic Republic News Agency, 2013).

Tabriz Central Library installations

In T.C.L, electronic and mechanical installations including generator, power transformer, powerhouse and ventilation systems, water storage reservoir, fire cock, electronic control circle, and study hall lightning and other installation are located in two different sections. Some installations such as water storage reservoir, ventilation systems, and fire installations are placed at the basement of main building. However, generator, gas oil storage, power transformer are located in a separated building. According to library installation expert water reservoir is utilized for supply drinking water. Heating-cooling systems use L.P.G (Liquefied Petroleum Gas) in normal situations and exploits gas oil in crisis. Generator is used for providing emergency power which has automatic performance and gas oil.

Passive defense requirements for electronic and mechanical Installations

According to passive defense, installations should have 5 featured characteristics in order to reduce vulnerability and enhance efficiency which including decentralization, precise site selection (location), paralyzing, renewability and operation continuity, and resistant instruments against explosion.

Decentralization

Structure and installation dispersion in a specialized location is defined as decentralizing (Movahhedinia, 2010). Basic and hazardous installation centralization, in this center such as generator, power transformer and gas oil storages in a building next to the main street indicates that decentralization principle is not obeyed in this library.

Site selection

Location is defined as the selection of suitable site for a land in a way that various parameters such as the shape and distance from main roads and city centers influence this selection with regard to their weights (Setareh, Zanganeh Shahraki, and Hoseini, 2010). The location of this centers' installation is not according to the passive defense principles, so that heating-cooling equipment is located at ground floor instead of building depth. Furthermore, basic installations like power transformer and generator are placed next to the main street and no protection is provided for them (Fig. 1). In this center, hazardous installations are next to each other and this matter can intensify damage in the crisis. According to mentioned matters, it can be concluded that for this center installation, proper location considerations are not provided from the prospective of passive defense. Furthermore, these installations have no pre-emptive measures and passive defense principles like covering, camouflage, and concealment.

a

b

Figure 1- (a) Installation room adjacent to the main street -(b) Incorrect location of T.C.L installations

Installation parallelization

According to passive defense principles, installation parallelization refers to the existence of a protective system in emergency conditions. Concerning mentioned matter, in this center, one generator is considered for producing UPS (uninterruptible power supply). Some gas oil reservoirs are considered for having cooling-heating systems ready in absence of L.P.G. Based on the mentioned matters, it seems that installation parallelization is obeyed in this center.

Renewability and operations continuity

Being adjacent with gas oil storages, incorrect site selection, some basic deficiencies, and the installation of T.C.L are very vulnerable and their renewability and operations continuity are not applicable in crisis. For instance, due to fire cocks' leakage, this installation is eliminated from the protection system and therefor, the firefighting system of this center is probably to face the major problems in abnormal conditions. Study hall electric boards threaten the safety of staffs and clientele and can cause secondary damages. Furthermore, according to this center's facilities engineer has experienced several electric shocks in this center (Fig. 2). However, diesel generator electric board is in line with international standards. In addition to mentioned matters, effective operation of fuel tanks cannot be achieved because of their adjacency to the diesel generator and their shallow position.

Resistant facilities against explosion

In T.C.L, installation protective walls and roofs have 20cm thick and are made of ordinary brick (Fig .3). The kind of material is not resistant against blast. Therefore, these protection systems are not in accordance with passive defense requirements. Considering all parts of this center, only manuscripts reservoir section is equipped with firefighting system. Therefore, explosion and fire condition severely threaten the safety of study hall, books storage section, staff rooms and other sections.

Conclusions

One of the most sustainable measures of passive defense in civil engineering, architecture and urban planning domains is to exploit explosion resistant structures, sustainable installations with good protections, and installation requirements observance based on passive defense. In this study, in addition to introducing the passive defense principles in installations, the observance and accordance of these principles in T.C.L is investigated. The results showed that however T.C.L is one of the most important centers from the view of manuscript reservoir, staff and clientele, passive defense requirements are not obeyed well.

Being adjacent to the main street, centralization of facilities, lack of update and explosion proof walls, deficiencies in firefighting systems, difficulty in renewability in crisis conditions,

besides of other neglected passive defense requirements are the main problems of their center in electric-mechanical installation domain.

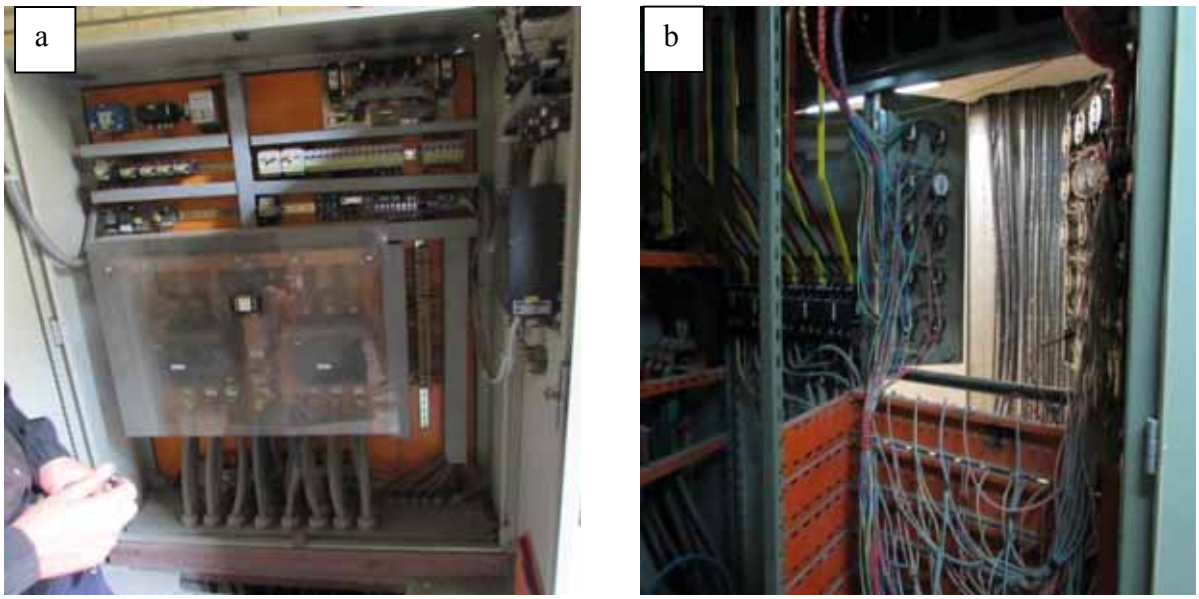

Figure 2- (a) Standard electric board of diesel generator, (b) Non-standard electric board of study hall

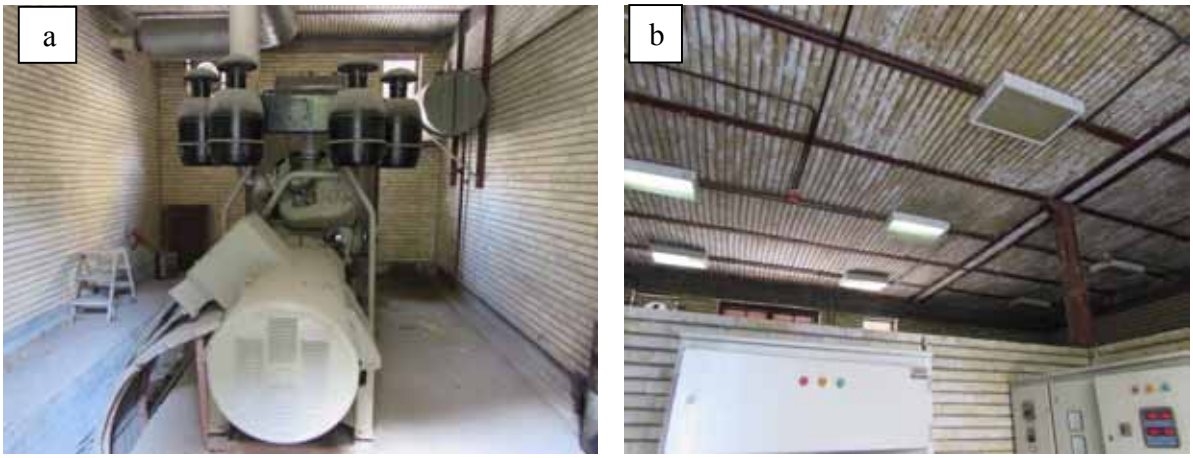

Figure 3- (a) Standard protection walls of diesel generator, (b) Non-standard roof of installation room

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