

MANDATORY IMPLEMENTATION STRATEGY OF THE IMPROVEMENT OF EXISTING BUILDINGS IN TAIWAN

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Abstract: As the buildings of Taiwan have been stepping towards the aging stage, the act of after-use maintenance of buildings gradually becomes a mainstream movement. After the serious fire of Welcome Restaurant happened in 1995, Taiwan government has been comprehensively implementing Public Safety Inspection Declaration System for the refuge facilities and the constructed facilities of buildings. Ever since the Chi-Chi Earthquake happened in 1999, the government forcibly and positively conducts mandatory inspection and renovation of the seismic resistance of public buildings in order to reinforce the public safety. Through on-the-spot survey, data analysis and review of local and foreign references, this study investigates the current implementation and the performance of the several mandatory and encouraging improvement systems positively executed in the buildings of Taiwan. The contents of this paper are divided into three parts: 1) Public safety inspection declaration; 2) Diagnosis, inspection and renovation of seismic resistance of buildings; 3) Improvement of obstacle-free facilities.

Keywords: seismic resistance, public safety inspection, obstacle-free facilities

1. INTRODUCTION

The buildings of Taiwan have been stepping towards the aging stage. According to the standards of Organization for Economic Cooperation and Development (OECD), Taiwan was considered at the level of a developed country as from the 1990's. According to the survey made by Construction and Planning Agency of Ministry of the Interior of Taiwan, the number of applications for construction licenses of new buildings submitted from 1980 to 1990 was decreased to around 3%, but that of old buildings was increased to as high as 97% (Chiang, 2005). With the needs of maintaining and renewing the life cycle of buildings, professional maintenance management (PMM) of building is getting more and more important. The renovation and maintenance projects of urban buildings tremendously outnumber the new construction acts. In the future, the act of renovation shall become a key issue of public safety and city landscape categorized under the issue of construction management and urban development. Therefore, it is necessary for the government to integrate the related laws and decrees, and combine the aspects of "public safety, social welfare and sustainable development." Particularly on the diagnosis and

assessment of buildings, evaluation of quality, and maintenance management system, they can be the legal business area grasped for architects and technicians. Adequate professionals, technical human resources and businessmen can activate the whole construction market, stimulate the development of economic activities, and further protect the life, properties and safety of people, and improve the quality of living environment.

Through the related existing mandatory improvement measures of buildings implemented by the government in the after-use maintenance mechanism, this study not only analyzes the autonomous reconstruction, renovation or any interior or exterior decoration by the owner and user of a building for residential or business purpose, Taiwan government is comprehensively implementing Public Safety Inspection Declaration System for the refuge facilities and the constructed facilities of buildings. Besides, the government forcibly and positively conducts inspection and renovation of the seismic resistance of public buildings in order to reinforce the public safety. Mandatory improvement of the obstacle-free facilities of buildings is also requested to enhance social welfare. Through these investigations in this paper, a workable direction for the

development of a maintenance system for the buildings of Taiwan can be constructed in the future. Particularly on the diagnosis and assessment of buildings, evaluation of quality, supervision of design and construction, and maintenance management system, can facilitate the transformation and upgrading of construction industry, and further improve the safety and quality of living environment.

2. ANALYSIS ON CURRENT IMPLEMENTATION

2.1 Public Safety Inspection Declaration

After the economic boom, the urban development of Taiwan became diversified. Different compound buildings appear continuously, creating more and more harm to the public space, and drastically increasing the number of illegal renewal and renovation of buildings, which have increase danger to the safety of construction space. To avoid creating harm to pedestrians, mandatory renovation should be implemented.

2.1.1 Secret Worry of Public Safety

After the release of martial law in Taiwan in 1987, many restrictions were released accordingly. Special businesses emerged prosperously, making it more difficult in integrating or differentiating the types of business for commercial registration, the purposes of use for land and buildings, and the classification of fire prevention standards. The recognition for the classification of industries to be applied in compliance with different legal regulations was still under construction, making a majority of buildings violate the regional land use restriction of urban planning. In addition, the people having activities around the district of special businesses were of complicated backgrounds. Some of them bearing grudge spoiled the public facilities, some of them deliberately set on fire. Unexpected damages emerged in an endless stream. As the urban environment is under drastic changes, all those harm and damages bring out unbalanced and worsened social order. Unfortunately, the space of buildings for different kinds of activities becomes the predominant secret worry of public safety.

Besides, the public awareness of crisis is insufficient and their abilities to deal with emergency are poor. In general, the people of Taiwan are incorrectly using the space of buildings. They always put inflammable objects along the corridor, at the entrance or exit or on the staircase platform, or lock the safety exits, thus making no way out in case of fire. People having activities in a strange consumption place generally have no habit of checking the escape route first. Thus, in case of fire, they are incapable of dealing with the accident, and cannot take appropriate contingency measures for escape from the fire environment.

In addition, some businessmen do not comply with the laws, and have poor knowledge of fire prevention and evacuation. They apply inflammable materials to the decorations and evacuation exits of their business place. For the sake of easy management, part of the business places have one main entrance opened only, and all other evacuation exits are blocked. And part of the businessmen

block the emergency exit, just for erection of gigantic advertisement board and signboard. Once there is fire accident, the fire fighting and evacuation measures are obstructed, creating serious casualties. Besides, some businessmen understand that their businesses are against the laws or are incompliant with the business item. They firstly apply for business operation at a small area, and then expand the business area in the later days, so as to decrease the cost for building safe facilities and avoid public safety inspection of buildings. Moreover, many buildings are found seriously in breach of rules and regulations. With the evacuation platforms being illegally occupied, the roofs of buildings may have been additionally constructed with small rooms without license. The fire escape lane (separation from fire) may have been built with living space, obstructing the escape, fire-fighting and rescue actions. The indoor partition may have been changed or the anti-fire and anti-smoke zones may have been destructed willfully, leading to the rapid spread of fire and dense smoke, and making people lose the time for escape. According to the records, more than 40,000 illegal buildings and facilities in the urban area has caused a high risk of danger.

2.1.2 Establishment of Public Safety Inspection Declaration System of Buildings

In 1995, a fire of Welcome Restaurant with serious casualties happened in Taichung, Taiwan. Before that, several great accidents were frequently happened in some business places. Immediately the Taiwan government revised the Construction Law, increasing the regulations for utility management of building and the related public safety inspection. The government's passive auditing and banning in the past were transformed to be a positive declaration mechanism for owners or users of buildings. Due to the insufficient manpower for enforcement of new regulations, the construction authorities urged the owners or users of buildings to actively maintain the legal use and structure of their buildings as well as the safety of the equipments. It is clearly announced that the owners or users of the buildings for public use should regularly appoint the professional bodies or experts, who were recognized by the central supervisory construction authorities, to conduct inspection and issue the related certificates. The inspection results and the related certificates should be declared to the local supervisory construction body so as for re-inspection at any time.

According to Construction Law, the owners or users of the buildings without the required inspection and certificates as well as the subsequent declaration in compliance with the regulations shall be fined, and requested to improve and carry out the required procedures within a limited period of time. If no improvement is made or the required procedures are not carried out before deadline, they shall be fined continuously, and officially suspended from the use of their buildings. If necessary, the water supply and power supply of their buildings shall be cut or the related facilities shall be forcibly dismantled. As to the buildings for actual business use, if their owners or users avoid, violate or reject the

inspection or re-inspection on the public safety of the buildings as required in the regulations of Construction Law, the owners or users concerned shall be fined, and also punished, forcibly requested to receive inspection and re-inspection time after time.

The two items of buildings to be declared include anti-fire protective facilities and safety equipment:

- I. There are eleven anti-fire protective facilities included: 1) Division of anti-fire zones. 2) Separation walls of non-anti-fire zones. 3) Interior decoration materials. 4) Entrance and exit of the protective layer. 5) Entrance and exit of floor other than the protective layer. 6) Corridors (indoor hallways). 7) Direct way to the staircase. 8) Safety ladder. 9) Special safety ladder. 10) Refuge platform on the roof. 11) Emergency entrance.
- II. There are six safety equipments included: 1) Lift equipment. 2) Lightning arresting equipment. 3) Emergency power supply system. 4) Special power supply. 5) Air-conditioning windpipe. 6) Gas equipment.

2.1.3 Benefits of Public Safety Inspection Declaration System

Due to the separation of administration and techniques, the owners or users of buildings have to bear the responsibilities, and the construction management authorities are responsible for spot inspection and re-inspection. When using the buildings, the owners of buildings should fulfill the principles that “owners are obliged to conduct acts which are at the same time beneficial to the public welfare.” They should be responsible for keeping their buildings at legal status. In case a building is violating the regulations, the owner of the building should be the first party involved. Only when the building is occupied or an irregular lease contract is signed, the occupying or leasing party shall be the party involved of the violation or punishment.

Regarding the nature of the utility management of building, the nature of the criteria of Construction Law refers to the rationality of structure, equipment, spatial planning and humanized size. Through approval, inspection of construction work and regular maintenance inspection declaration, the health and safety of buildings are ensured. In a narrow sense, it is an approval management of the buildings' hardware. Therefore, it belongs to a kind of professional technical science. Regarding the approval, inspection, certification and regular safety inspection, as well as the measures like banning and official suspension of construction work, termination of use, fine, water cut, power cut, demolition, transfer to court, and so on, all of them are to ensure that the buildings are planned, designed, constructed and maintained according to the regulations of Construction Law and Construction Technical Rules, and to prevent the buildings from being constructed, started construction work, used and changed without advanced permission. The so-called “use” refers to the use of the

structure, equipments and size of space of the originally approved blueprint of building, but does not imply to any business acts “in breach of rules or regulations” because the domain of “business acts” is not under the restriction of Construction Law, but judged by the business supervisor according to the laws. This is a concept that should be clarified imminently so as to achieve the legal use of the structure and equipments of buildings, and let maintenance and renovation return to the legislative nature of Construction Law.

2.1.4 Brief Summary

Summarizing the above discussions, the crux of the problem of obstructing the implementation of the maintenance of public safety of buildings is the habitual concept and practice of the public, which extremely need to be corrected, eliminated or suppressed. The implementation mechanism of the government authorities should be sound, the law-enforcing environment should be improved, and the preventive measures and the relevant education should be taken in advance.

2.2 Evaluation and Implementation of the Inspection and Renovation of Seismic Resistance of Buildings

Taiwan is located at a geographical position with earthquake frequently happened. In order to reinforce the seismic resistance of the existing buildings, and in view of the academic studies made and the multiple substantial earthquake disasters experienced in recently years, the government authorities consider revising the structural load of building for resistance of earthquake, hoping to avoid any tangible natural disaster in the living environment.

2.2.1 Promotion and Establishment of the Enforcement of Seismic Resistance of Buildings and the Related Measures

Immediately after the Chi-Chi Earthquake happened on September 21st in 1999, Construction and Planning Agency positively promoted seismic resistance inspection mechanism. The co-supply contractual purchase of “Detailed Evaluation Work of Seismic Resistance of Buildings” was performed in April 2005. Meanwhile, the government signed agreements with 10 academic institutions and professional organizations, urging the municipalities and the county (city) governments, as well as the various affiliated authorities to conduct detailed evaluation of the seismic resistance of the buildings under restriction.

2.2.2 Budget Execution

In 2005, Construction and Planning Agency paid a fund of NTD \$90 million to the municipalities and the county (city) governments so as to subsidize their detailed evaluation of the seismic resistance of buildings. Up to end November 2005, the fund allocation to the various governments had been completed. As from 2005, in alignment with “Contingency Prevention and Rescue Project of Tsunami Disaster,” all the county and city governments,

with those located at the coastal area being prioritized, conducted detailed seismic resistance evaluation of buildings. From 2000 to 2005, the implementation work spent about NTD \$380 million.

2.2.3 Seismic Resistance Information Management System

This system was gradually constructed in two stages. The first stage was mainly the construction of seismic resistance evaluation and survey of buildings, including “Basic Data Survey of Public Buildings of Different County and City Governments,” and “Preliminary Seismic Resistance Evaluation of Buildings.” The second stage was mainly the examination of the detailed seismic resistance evaluation information of buildings. As from 2005, the detailed seismic resistance evaluation information of buildings submitted by the municipalities and the county (city) governments were firstly collated. In future the information shall be included in the evaluation information of different ministries and departments of Central Government so as for effective management and use by the related units.

As of end December 2005, the municipalities and the county (city) governments had completed 478 detailed evaluation cases. In addition, there are 923 cases having finished preliminary evaluation by the Ministry of Economic Affairs. Among them, 208 cases shall receive detailed evaluation. The Ministry of Education examines 3,044 schools of different grades as well as the national social and educational organizations which are applicable to “Implementation of Seismic Resistance Evaluation and Strengthening Projects of Buildings.” Up to now, there are 2,325 cases having performed preliminary evaluation of buildings. Among them, there were 1,171 cases which should implement detailed evaluation of buildings after preliminary evaluation, 488 cases having completed the detailed evaluation, and 584 buildings having completed the related strengthening operation. Apart from these, a structural safety evaluation operation mechanism of buildings should be established for the private schools of different grades as well as the national social and educational organizations. After the seismic resistance of buildings is evaluated, a list of priority for strengthening the schools and centers with potential danger should be established. Year by year strengthening work and improvement should be done to improve the seismic resistance and safety of the buildings of schools as well as the social and educational organizations.

There was a total of 278 cases of facilities of the stations and engine rooms of the Ministry of Transportation Communications that should be under restriction and should conduct seismic resistance evaluation. Up to now, there were 258 cases having completed preliminary evaluation, 99 suspected cases needed to receive detailed evaluation, 3 cases having been reconstructed, and 6 cases having completed the strengthening work. There are still 20 cases in need of preliminary evaluation, and 90 cases waiting for detailed evaluation.

2.2.4 Emergency Assessment of Dangerous Buildings after Relief for Accident

In order to send the related professional and technical staff to the places where disastrous earthquake is happened, an emergency assessment of the extent of destruction of the damaged buildings should be preliminarily made within a short period of time. In 2004, Construction and Planning Agency promulgated “Group Training Plan for Emergency Assessment of Dangerous Buildings after Relief for Accident.” A training lecture was held for the seed teachers of emergency assessment staff of dangerous buildings after relief for accident. There were 182 people coming from different architects associations, professional civil engineers associations, professional structural engineers societies and project technicians associations, as well as the municipalities and the county (city) governments. As of end December 2005, the Agency has subsidized the architects, civil engineers, structural engineers and project technicians associations to hold lectures about Emergency Assessment of Dangerous Buildings after Relief for Accident. The seed teachers having been trained in the abovementioned lecture acted as the lecturers of the conferences for different associations and societies.

2.2.5 Brief Summary

Regarding the seismic resistance evaluation of buildings, the preliminary seismic resistance evaluation of buildings was completed by the Ministry of the Interior in 2004. Right now detailed evaluation is under process. Other ministries and authorities of Central Government successively carry out preliminary evaluation and detailed evaluation. In the year of 2006, the seismic resistance evaluation of buildings shall be still implemented continuously according to the expected progress.

Regarding the seismic resistance evaluation and strengthening work of the existing buildings, the related ministries and authorities shall discuss the administrative projects to be mandatorily promoted so as to take follow-up promotion of the related laws of seismic resistance evaluation and strengthening of buildings.

2.3 Improvement and Renovation of Obstacle-Free Facilities

In 2005, it is stipulated in new added Article 10 of the Constitution of the Republic of China that “the country’s construction of obstacle-free environment for the mentally and physically disabled ... should be protected, assisting them in supporting and developing themselves independently.” In the past years at the stage of economic growth, there was a lack of consideration for obstacle-free environment. As the life of our population is gradually lengthened, it is necessary to conduct the improvement and renovation of the obstacle-free environment in the existing space, and avoid any intangible harm created to the spatial facilities in the living environment. In 1997 the Revised Physically and Mentally Disabled Protection Law was promulgated, clearly requesting the buildings for public use

to build obstacle-free facilities for the use by the aged and the handicapped.

2.3.1 Analysis on Necessity of Environmental Renovation

1) Contingency Policies of the Aging Society

Taiwan has been marching towards the aging society. There is a trend that the aged population at above 65 has been increasing gradually. Besides, the growth of much more aged people rises continuously. According to the data provided by the Council for Economic Planning and Development, the aged population at above 65 was 8.79% of the total population in 2001, and is estimated to be 10% in 2011, and even 20% in 2231 (Reported by Council for Economic Planning and Development). These figures showed that the aging speed of population is very fast. Due to the advancement of medical technology, people's lives are lengthened, and the statuses of diseases are changed, tremendously increasing the demand of care for chronic disease patients and the disabled. Besides, due to the attributes and special needs of the physically and mentally disabled, we have to consider the obstacles and difficulties encountered by them during their learning, working, daily life and recreation. As of December 2004, the Ministry of the Interior issued 912,000 Handicapped Handbooks for the related citizens. Therefore, to create an obstacle-free living environment for all the people of Taiwan is regarded as an important goal of the social welfare policies promoted by different countries all around the world in recent years.

Therefore, "obstacle-free environment" is to rule out different tangible and intangible obstacles existed in the living environment, and let the people with mobility problems use different resources as convenient as general people. This is just an attempt to improve the buildings, enrich the equipments and facilities and change the attitude of the social public, providing an obstacle-free living environment for all the people of Taiwan.

2) Special Requirement of Tracing the Past Improvements

According to Section 3 of Article 56 of Protection Law for the Physically and Mentally Disabled, "For the public buildings, activity sites and public transportation tools already obtained the construction license or open to the public for use, if their obstacle-free equipments and facilities do not comply with the requirements stated in the above section, or do not comply with the revised requirements after the requirements of the above section are revised, the supervisory authorities of the businesses of different grades and purposes should order the related owners or the responsible persons of the management organizations to make improvement. However, under such special circumstances as the military restriction, maintenance of historical relics, natural environmental factors, restriction on the structure or equipments of building, and so on, the owners or the responsible persons of the management organizations of those having difficulties in installing obstacle-free equipments and facilities shall submit the substituted improvement plans, which shall have to be declared to and approved by the supervisory authorities of the businesses of different grades and purposes, and a

deadline of improvement shall be given." According to Article 71 of the same Law, those are not improved shall be fined, and the buildings concerned shall be strictly punished by means of water cut, power cut, blockade and compulsory demolition.

3) Scope of Application for Installing at Buildings the Facilities for People with Mobility Problems

On Nov. 27, 1996, Chapter 10 was added to Design and Construction Work of Buildings in Construction Technical Rules, stipulating the special regulations for the facilities provided to the people with mobility problems, with 16 public buildings included in the scope of application, such as social welfare organizations, schools, hospitals, bus stations, government departments ... etc. All the newly-built public buildings should be installed with obstacle-free facilities, where as the existing buildings have to make improvement.

4) Functional Requirements of Improvement and Source of Funds

The "Operation Procedures and Recognition Principles of the Substituted Improvement Plan for the Obstacle-Free Equipments and Facilities of Public Buildings Already Obtained Construction Licenses" and "Storage and Application Methods of the Income/Expenditure of Improvement Funds for Obstacle-Free Equipments and Facilities of Buildings" are taken as the reference for improvement of public buildings already existed before Nov. 27, 1996 as well as the establishment and application of funds.

2.3.2 Analysis on the Improvement of Proper Facilities of Obstacle-Free Environment in Public Space

As for the improvement performance of the public facilities and hardware, according to the Report on Business Supervision of Obstacle-Free Living Environment of 2005 made by Construction and Planning Agency, there were 33,429 cases (20,019 cases before Nov. 27, 1996 plus 13,410 cases after Nov. 27, 1996) of public buildings under partial total restriction, 660 cases (64 cases of new construction, 564 cases of existing cases) of balconies and roads (sidewalks) under partial total restriction. The most common hardware and environmental shortcomings are described below. Among them, the greatest shortcoming is found in the improvement items of additional construction of elevator and obstacle-free toilet.

1) Obstacle-Free Facilities and Equipments of Buildings:

(1) Shortcomings in the Establishment of Obstacle-Free Toilet: The common shortcomings are the inappropriate installation of rails, insufficient turning space, insufficient space beneath the washing basin, unavailable access for wheelchair, and so on.

(2) Shortcomings in the Establishment of Slope: Including the excessively long diameter of handrail, inappropriate construction of the central platform, or the affected mobility of wheelchair due to the guide bricks on the slope for the blind, and so on.

(3) Shortcomings in the Establishment of Facilities Leading to the Entry: Improper position of guide

bricks for the blind, erected handrails being not conforming to the requirements, and so on.

(4) Shortcomings in the Establishment of Obstacle-Free Elevator: The Braille is inappropriately positioned, and the flat handrails inside the elevator are not suitable for holding.

(5) Shortcomings in the Paving of Floor Materials: The floor is not paved by anti-slippery materials.

2) Obstacle-Free Facilities and Equipments of Roads:

(1) There is inappropriate construction of obstacle-free slope which is led to the intersection. The gradient of slope is not conforming to the requirements.

(2) The guiding facilities for the blind are incomplete. Between the road for vehicles and part of the sidewalk edges, there is a step difference, where protective measures should be taken and guiding facilities should be installed.

(3) The excessively large holes on the lattice ditch cover are not conforming to the requirements. Sometimes the ditch cover is placed in wrong direction. The direction of lattice hole is perpendicular to the rolling direction of wheelchair, making the wheelchair depressed in the holes easily.

2.3.3 Professional Organizations and Professional Staff

The central supervisory bodies regularly hold lectures and training courses about obstacle-free environment for county and city governments, construction staff and the related staff so as to enhance their cognition and professional abilities of obstacle-free environment. There are obstacle-free inspection teams or committees established in different county and city governments. They are formed by the representatives of the mentally and physically disabled organizations, architects, professionals, scholars and representatives of government departments, who inspect and check on the conditions of the obstacle-free environment. Based on the extent of emphasis, different county and city governments hold promotion activities and distribute printed propaganda to spread the obstacle-free idea to the public.

2.3.4 Brief Summary

It is also called "Comprehensive Considerate Design" and "Full-Range Design." The planning and design of all the equipments and artificial environments as well as the subsequent maintenance should comprehensively consider all the users, including the aged, women, children and the handicapped. The design should be simple, easy for operation, and applicable to everybody. It refers that the environment is comfortable to the physically disabled people, as well as the healthy people. It also means that the obstacle-free environment is melted in the universal design. Apart from formulating regulations for forceful implementation of obstacle-free environment, in recent years the advanced countries mostly import the idea of universal design to the non-mandatory indicating part. This idea stresses the convenient use, simple and easy operation,

and extensive applicability of buildings, equipments and facilities.

3. CONCLUSION

According to the Organization for Economic Co-operation and Development (OECD), Taiwan has already been considered at the level of a developed country. The renovation and maintenance projects of urban buildings tremendously outnumber the new construction acts. Therefore, the acts of renovation and maintenance, renewed urban development and construction management not only shall become the main issues, and the most important keys to the sustainable the environmental development policy of Taiwan, but also the main challenges and business sources to the architects in the 21st century. Currently, this study takes the major renovation and maintenance policies of the Ministry of the Interior, a the main issues of investigation, including "public safety inspection declaration," "enforcement of the seismic resistance of buildings" and "obstacle-free environment." The stressed "social welfare, sustainable development and public safety" not only are the main construction management policies of Taiwan government, but also the most important indices for the evaluation of global competitiveness among the countries all around the world, as well as the clear visions for pursue of safe and healthy buildings in the 21st century.

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