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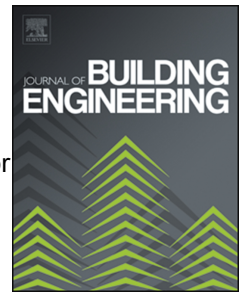

Sustainable building maintenance for safer and healthier cities: Effective strategies for implementing the Mandatory Building Inspection Scheme (MBIS) in Hong Kong

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Sustainable building maintenance for safer and healthier cities: effective strategies for implementing the Mandatory Building Inspection Scheme (MBIS) in Hong Kong

ABSTRACT

The prevailing trend of building ageing and dilapidation in Hong Kong has instigated the promulgation of the Mandatory Building Inspection Scheme (MBIS) as a statutory measure in handling the long-lasting problems related to building decay which mostly occur in existing private buildings aged 30 years old or longer. This paper aims to highlight the present situation of building deterioration in Hong Kong, and to determine and explain the effective recommendations or good practices for executing MBIS through an empirical survey. Most of the respondents perceived that: (1) Establishing detailed guidelines and clear standards for building inspection and remedial works under MBIS; (2) Offering more technical and financial assistance from the government to property owners to aid the execution of MBIS; and (3) Enhancing the public awareness on MBIS through different media, are the three most effective recommendations or good practices for MBIS. Such findings have enabled building owners and various industrial practitioners to equip with better knowledge and deeper understanding about MBIS for optimizing the implementation procedures in future.

Keywords: Building inspection; Building safety; Building repair and maintenance; Recommended strategies; Hong Kong

1. Introduction

In Hong Kong, building neglect and deterioration has been perceived as a serious and long-lasting problem besetting both the government and the community. A multitude of dilapidated premises in deficiency of regular repair and maintenance will cause potential safety and health hazards to the tenants or even the passers. The conditions of such buildings are more likely to deteriorate with their increasing building age. Those buildings spanning more than three decades are often fraught with different types and levels of building defects, for example, spalling of concrete, exposure of rusty steel reinforcement bars, leakage of sewage pipes, structural or non-structural cracking, flaking of finishes and mosaic tiles from walls, etc (Buildings Department 2011). These common defects should be discovered earlier and rectified swiftly to avoid the evolution to serious accidents or even catastrophic tragedies, for example, sudden collapse of an existing building.

The Buildings Department (2017) promulgated over 45,400 statutory orders / notices to investigate the defective buildings or its elements, and to carry out prescribed inspections or repairs for buildings under the Mandatory Building Inspection Scheme (MBIS) between 2006 and 2016 in Hong Kong (Table 1). The aggravating trend of the local dilapidated buildings was manifested by the vast number of statutory orders/notices issued.

Table 1. Statutory orders / notices promulgated on investigation of building defects and prescribed inspections / repairs under MBIS (Buildings Department 2017).

Year	Demolition	Repairs	Investigation of buildings defects	Defective drainage repairs	Prescribed inspections/repairs for buildings under MBIS	Total
2006	14	636	47	344	------	1,041
2007	2	690	20	371	------	1,083
2008	11	459	22	435	------	927
2009	8	530	81	524	------	1,143
2010	13	1319	326	588	------	2,246
2011	6	394	44	352	------	796
2012	1	307	182	321	------	811
2013	12	330	35	305	------	682
2014	10	213	12	305	17,537	18,077
2015	48	213	17	311	11,519	12,108
2016	5	557	85	322	5,571	6,540
				Total number of orders / notices issued (2006 -2016)		45,454

Buildings can provide a comfortable and safe living environment. However, per Choi (2008) it is very common to locate some dilapidated buildings particularly in the old districts like Kwun Tong, To Kwa Wan, Wanchai, Sham Shui Po, and Mongkok. Chan (2000) also observed that usually no repair and maintenance fund is set up for these buildings to provide routine management and adequate maintenance. Lack of regular repair and maintenance of buildings may endanger the residents and public safety, and also reduce the property values. It should be a matter of real urgency in addressing this long-standing besetting problem because of an obvious relationship between the living place and the state of health of the residents based on the extant literature (Yau et al. 2009; Tanaka et al. 1996; Schmitt et al. 1978). It appears to be an

imminent need for tackling the prevailing status of dilapidation and decay of the current aged private buildings.

2. Previous work on building maintenance and decay

Urban decay has become a prime concern and hot topic in the community of Hong Kong during the past decade. The conditions of the building will become impaired over time because of the poor quality level of workmanship and materials during construction, accompanied by inadequate building maintenance services after occupation (Law 2008). It is important that the building owners undertake a regular inspection of the conditions of their residential facilities, detect any defects earlier and make a case for any necessary repair works promptly. Chan (2000) referred the problematic buildings in lack of appropriate care, repair, and maintenance as "dilapidated buildings". The status of building dilapidation is exacerbating in Hong Kong due to the construction boom throughout the 1960s (Leung and Yiu 2004).

Chan and Morris (1997) advocated that the delivery speed of buildings from late 1960s to early 1970s was swift but with sacrifice of quality and workmanship. It corroborates the proposition of Leung and Yiu (2004) that the private premises completed during the same period will deteriorate faster than usual due to the "high chloride content of concrete adopted" for the structural building elements. Moreover, Hui et al. (2008) attributed challenges for building ageing problems to the relatively hot and humid weather in Hong Kong, accompanied by substandard construction materials and poor workmanship, and less stringent legislation.

With reference to the study of Hong Kong 2030: Planning Vision and Strategy (2001), there will be a drastic surge in the number of old premises, particularly the double of the number of buildings of 30 years old or above by 2018. Hui et al. (2006) also echoed an expected rise in the number of buildings of 30 years' lifespan or above from approximately 16,000 to over 22,000 within the period of a decade by 2018. Thus there would be a gradually augmented trend of building decay in near future of Hong Kong.

It is well conceived that building dilapidation is attributable particularly to the lack of regular repair and maintenance (Leung and Yiu 2004). Various types of building defects like structural or non-structural cracking, falling of concrete debris and flaking of mosaic tiles are usually encountered towards those buildings over 30 years old. These defects should be detected and remedied as early as possible in order to avoid disastrous consequences such as an abrupt collapse of an existing building or its structural components which are deterimental to both the residents and pedestrians (Ho and Yau 2004; Yau 2010). Property owners will also have to bear a heavy financial burden arising from the stipulated works of repair and maintenance to their occupied buildings (Poon 2008).

Besides, the traditional multi-ownership composition of high-rise buildings in Hong Kong frequently hamper the rectification works for the shared public facilities within the premises like the staircases, corridors, and entrance foyers (Lai and Chan 2004; Yau et al. 2008). A comprehensive desktop literature search from Robinson and Reed (2002), Chau et al. (2003), Martinaitis et al. (2004), and Hui et al. (2008) found that property values can be retained or even boosted as a result of regular upkeep and proper repairs. Small (2009) further advocated

that the establishment of a well-planned preventive maintenance scheme (rather than remedial actions) for existing old building stock will enhance the health and well-being of such facilities.

Several published literatures suggested incorporating typical elements or items for building inspection or maintenance. For instance, Horner et al. (1997) recommended the execution of building maintenance practices according to the profound failure items in such buildings directly affecting health, safety, environment or utility. Wright (1999) proposed facade inspection regulations for the six cities within the United States: New York, Detroit, Boston, Columbus, Ohio and Chicago. Other than financial constraints, lack of requisite skills and knowledge has been perceived to be a major hindrance of building maintenance actions (Kangwa and Olubodun, 2003).

To cope with the problems with building neglect and deterioration, the Government of the Hong Kong Special Administrative Region (HKSAR) has introduced several effective schemes over the past decade including the voluntary Building Safety Inspection Scheme (BSIS), Building Safety Loan Scheme (BSLS), and the Building Management and Maintenance Scheme (BMMS) (Poon, 2008). The execution of these innovative measures has raised the public awareness of private flat owners on proper management and maintenance of their buildings. However, the widespread serious problems have not yet been settled completely as these schemes are implemented on a voluntary basis rather than as mandatory requirements (Buildings Department, 2011).

In addition to Hong Kong, various mandatory building inspection measures have been executed in different countries or cities, for example, in Singapore, New York City and City of Chicago (Lo et al., 2012). These countries or cities have promulgated their own building inspection schemes in 1999 (Singapore), 1998 (New York City) and 1990 (City of Chicago), which is much earlier than MBIS in Hong Kong by at least 10 years. The implementation mechanisms of individual schemes, such as target buildings, inspection cycle, scope of inspection items, exemptions from mandatory inspection, and qualifications of building inspectors, varied between different countries or cities.

Regarding the target buildings, non-residential buildings up to the age of 5 years old and residential buildings up to the age of 10 years old will be required to be inspected in Singapore. However, there is no age requirement for the buildings to be inspected in both New York City and City of Chicago. In terms of the inspection cycle, no definite time interval is established in City of Chicago whereas Singapore and New York City are similar in setting the inspection cycle of every 5 years. This requirement seems appropriate for the avoidance of excessive inspections and unnecessary disturbance to the residents due to the statutory execution of building inspections.

Structural elements and external walls must be included and evaluated within the scope of inspection items, since they are essential components with higher impact on public building safety, therefore, the existing building inspection schemes usually cover one or both elements. There is a height or storey exemption for both New York City and City of Chicago but not in Singapore. Buildings with less than 6 storeys are exempted from the scheme of New York City, and with lower than 80 feet in height exempted in City of Chicago. Lastly, the building inspectors required to carry out inspection works in Singapore are limited to structural

engineers only, while licensed architects are also recognized as qualified inspectors in the two cities of the United States.

3. Establishment of Mandatory Building Inspection Scheme (MBIS)

In recent years, the Hong Kong SAR Government has launched several schemes such as the voluntary BSIS and the BSLS to combat the problems arising from building neglect and dilapidation. However, these schemes are executed on a voluntary basis, and hence they have not adequately handled the existing problems. The Housing, Planning and Lands Bureau (HPLB) then launched two rounds of open consultations in December 2003 and October 2005, respectively with the aim of facilitating the requirement for a long-term holistic measure to tackle the building neglect issues (Development Bureau 2010a). The government eventually promulgated a working schedule to put forward the legal execution of the Mandatory Building Inspection Scheme (MBIS) in mid-2007 via several extensive public forums over years (Development Bureau 2010b). Figure 1 portrays the chronicle of the development of MBIS which has been fully executed since 30 June 2012 (Buildings Department 2012a; Buildings Department 2012b).

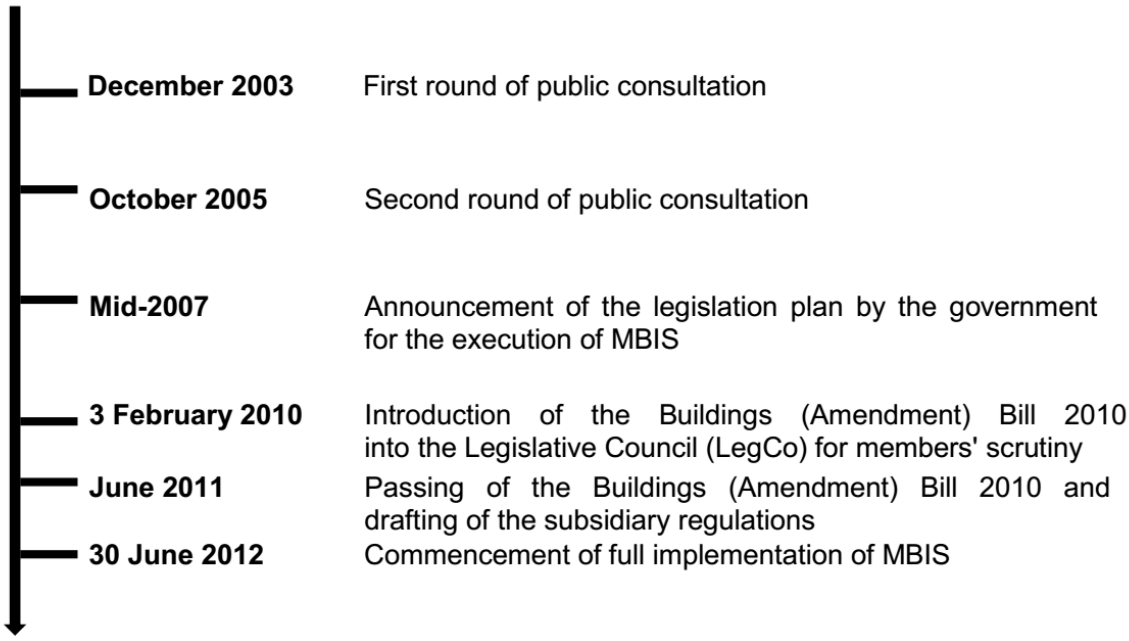


Figure 1. Development timeline of the Mandatory Building Inspection Scheme (MBIS).

3.1. Highlights of MBIS

Legislation of the Mandatory Building Inspection Scheme (MBIS) is perceived to be an effective strategy to cope with the prevailing building dilapidation for warranting periodic inspections and prompt repairs for buildings. MBIS was envisaged to cover the current stock of private buildings of 30 years old or above, but excluding those domestic buildings of no more than three storeys in height. A Registered Inspector (RI) is required to be appointed by the building owners to conduct the stipulated inspections once in every ten years, and then a Registered Contractor (RC) to undertake the stipulated rectification works deemed significant

of the common faciltiies of a building after inspection under the pursuit of a Registered Inspector (RI) (Buildings Department 2015).

Approximately 2,000 of such buildings per year (or 500 buildings quarterly) will be chosen by the selection panel of the Buildings Department (BD) for issuing the statutory orders under MBIS. The target buildings to be inspected every year under MBIS would epitomize a diverse pool of premises regarding various age profiles and building conditions across different districts throughout Hong Kong. As at 31 December 2016, 34,627 legal notifications have been issued by the BD including statutory orders of those private buildings envisaged for statutory building inspection and certificate letters upon the completion of the prescribed rectification works of the selected premises after inspection (Buildings Department 2017).

3.2. Coverage of inspection items

The building inspection process shall basically cover four major types of building elements detrimental to public safety: (a) External elements and other physical elements; (b) Structural elements; (c) Fire safety elements; and (d) Drainage system; as well as to spot any infractions in the form of "unauthorized building works in the common parts and on the exterior of the building" (Buildings Department 2015). The details of inspection items are shown in Figure 2.

3.3. Supporting measures of MBIS towards property owners

In partnership with the Hong Kong Housing Society (HKHS) and the Urban Renewal Authority (URA), the local government has introduced several various supporting measures or assistance schemes to assist individual private property owners in meeting the legal requirements under MBIS (Figure 3). A one-stop contact point of service has been provided for soliciting information and advice on technical and financial support by the HKHS or URA. Eligible building owners may apply for different categories of assistance and supporting schemes from them and the government throughout various execution stages of MBIS.

4. Research methodology

During March and April of 2015, different major project stakeholders within the construction and property management sectors were approached via an empirical survey to glean the holistic opinions and perceptions on the recommendations or good practices for executing MBIS in Hong Kong. A total of 13 perceived recommendations or good practices for MBIS were identified from the contemporary desktop literature review and relevant government promotional materials to develop the contents of the draft survey form. A pilot study was subsequently launched with several experienced senior industrial practitioners participating in new building construction or building repair and maintenance. While eight senior practitioners involved in the pilot survey were very satisfied with the identified items on the draft survey form, they also provided minor modifications in the description of some items and one practitioner added one new item on which the authors had agreed. Hence a total of 14 surveyed items were included on the final survey form which were found to be adequate, clear and relevant before massive distribution in town.

The target participants were invited to score their degrees of agreement on each of the perceived recommendations elicited on the questionnaire according to a five-point

measurement scale (5 = strongly agree; 4 = agree; 3 = neither agree nor disagree; 2 = disagree; and 1 = strongly disagree). They were reminded to return their completed questionnaires via electronic mail communications wherever possible before the planned deadline. Any other unlisted recommendations on the survey form were also welcome to be suggested and rated by the respondents with reference to their individual perspicacity and hands-on observations, but they recommended no additional items in the end.

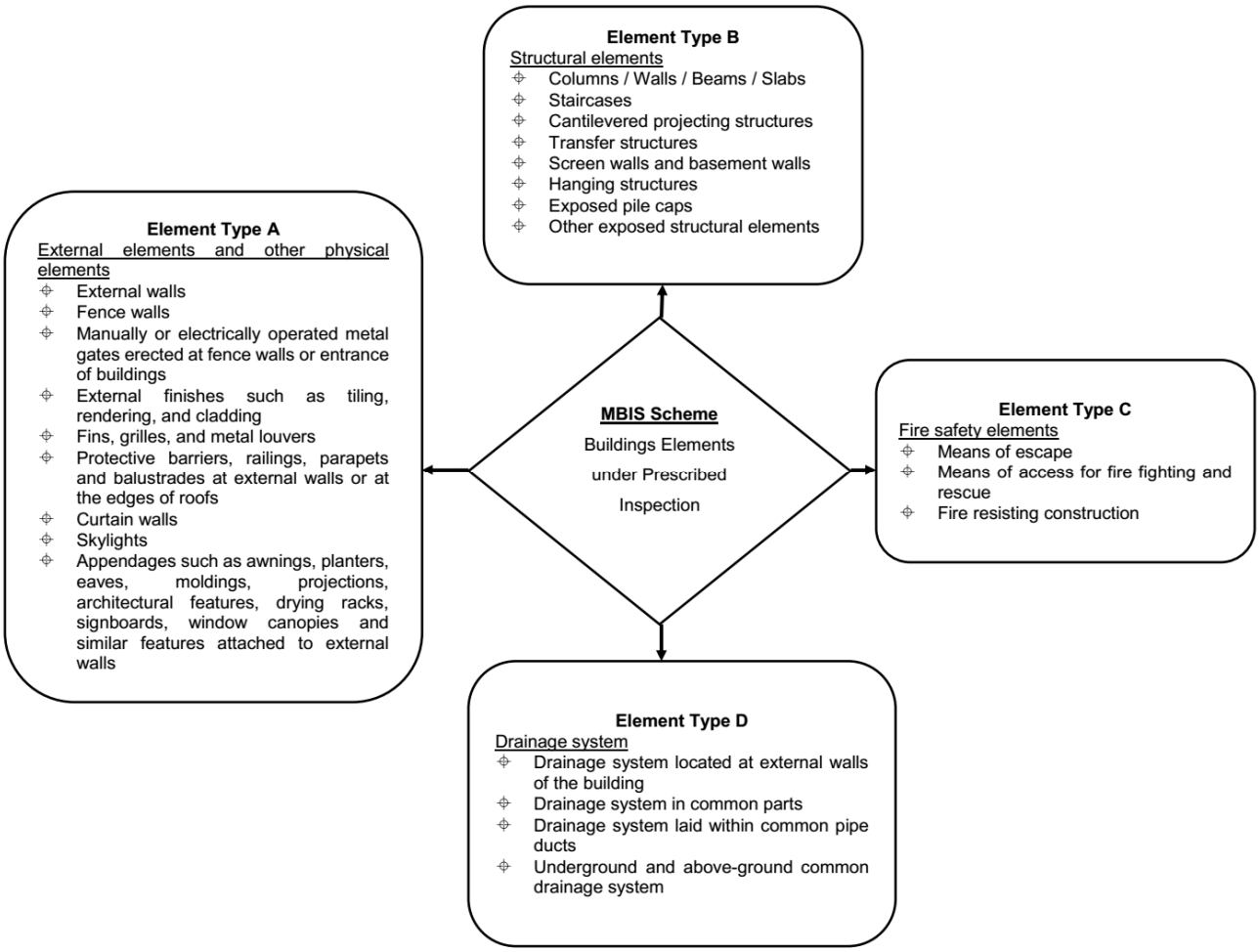
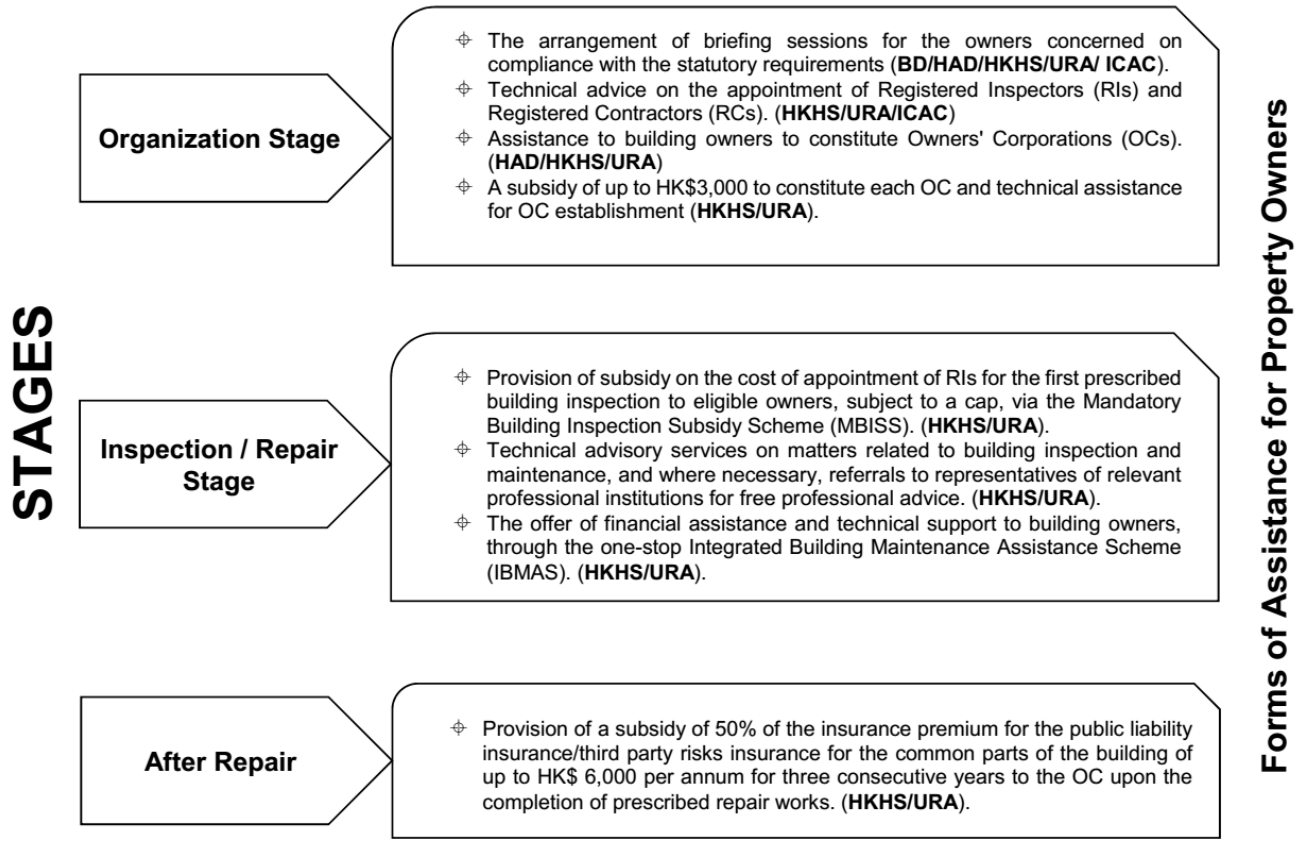


Figure 2. Examples of the building elements under prescribed inspection of MBIS (adapted from Buildings Department 2015).



Notes: Buildings Department (BD), Home Affairs Department (HAD), Hong Kong Housing Society (HKHS), Independent Commission Against Corruption (ICAC), Urban Renewal Authority (URA)

Figure 3. Supporting measures and assistance schemes of MBIS (Buildings Department, 2015).

4.1. Solicitation of survey data

The self-administered survey questionnaire was distributed to the target respondents ranging from industrial practitioners engaged in the relevant government works departments, related non-government client organizations (Hong Kong Housing Society and Urban Renewal Authority), private building developers, consulting firms of various professional disciplines (i.e. architects, engineers and surveyors), construction contractors, together with property management firms in Hong Kong. Intended professional respondents from relevant government works departments (i.e. Buildings Department, Architectural Services Department and Housing Department) were randomly picked up from the government-maintained web-based telephone directory as they may have already participated in MBIS execution (Chan and Choi 2015). Moreover, a sizable number of the potential participants were randomly chosen from the member lists of the Real Estate Developers Association of Hong Kong, Hong Kong Contractors' Association and Hong Kong Association of Property Management Companies, together with from the directories of registered professional members of the Hong Kong Institute of Architects, Hong Kong Institution of Engineers and Hong Kong Institute of Surveyors. Some of the target respondents were selected as well based on the previous contacts solicited by the researchers from their completed research projects.

A total of 852 blank survey forms were dispatched to individual identified practitioners through various means of post, email and direct hardcopy distribution by hand. These respondents comprised of different disciplines and professions like building surveyors, civil engineers, structural engineers, building services engineers, architects, maintenance surveyors, property services managers, and project managers whose opinions and responses are of significant relevance in the execution of MBIS. Ultimately, 340 completed valid survey forms were received yielding a return rate of almost 40%.

4.2. Profile summary of survey respondents

Over one-fifth (23.5%) of the survey respondents are from public client organizations, and the majority of them are contractors (28.2%) and consultants (25%). The remaining respondents are from private client organizations (14.7%) and property management companies (8.5%), and this profile represents a diverse spectrum of industrial practitioners involved in MBIS. A sizeable majority (67.6%) of the respondents have derived over 5 years of work experience in "new works", whereas more than 45% of them have possessed more than 5 years of work experience in “building management or repair/maintenance”. Meanwhile, two-thirds (66.5%) of the respondents lives in private residential buildings, 26.1% in public housing blocks, and the rest of 7.4% beyond these two groups of residence.

All the respondents have gained a wide range of practical experience and requisite knowledge in either new construction or repair/maintenance sector as indicated on the returned survey forms, thus their perceptions and responses gleaned would be regarded as valid and representative of the survey population. The SPSS software program version 22.0 was adopted to collate and analyze the collected questionnaire data.

4.3. Statistical tools for data analysis

Several statistical tools were adopted in this study to check for reliability and compare the opinions between various groups of survey respondents on the recommendations for MBIS. First, the collated survey data were analyzed and ranked by the mean score ranking method which was utilized by Chan *et al.* (2010). The Cronbach’s alpha reliability test was applied to measure and evaluate the internal consistency or reliability of the collated responses according to the five-point measurement scale adopted for the identified recommendations on MBIS (Santos, 1999). Then both the Kendall’s concordance test and the chi-square test were undertaken to assess the level of agreement of various respondents within a certain group based on their mean rankings of recommendations for MBIS (Chan and Hung 2015). The Spearman’s rank correlation coefficient (r_s) was used to evaluate the degree of correlation between any two participant groups on their rankings of recommendations for executing MBIS (Chan *et al.* 2010). A non-parametric test in the form of Mann-Whitney U test was used to uncover any statistically significant differences in the median values of the same item of recommendation between any two survey groups (Chan and Hung 2015). Finally, factor analysis was carried out to consolidate the collated survey responses on the 14 individual recommendations for MBIS into some underlying clustered factor groups for further illustration (Hair *et al.* 2010).

5. Results of data analysis

The results derived from the questionnaire survey were cross-referenced to the published literature both nationally and internationally whenever deemed appropriate, to reinforce the credibility of the findings obtained from the research data and subsequent analyses. The validation process was undertaken through a discussion forum by presenting the overall survey results to the 8 senior industrial practitioners involved in the pilot survey with extensive hands-on experience in dealing with building management and maintenance issues and problems, via open discussions and moderations to share and validate the research findings and possible explanations with the industrial practitioners involved in the study. The survey findings were well received and supported by them. Thus the survey responses gleaned would be regarded as valid, consistent and genuine of the actual execution of MBIS in town.

The Cronbach's alpha reliability coefficient for the 14 identified recommendations for MBIS is 0.761 which is significant and greater than the threshold value of 0.70 (Norusis 2002; George and Mallery 2003). It implies that the adopted five-point measurement scale is reliable and the collected responses are internally consistent in terms of the correlations amongst the 14 individual recommendations at the 5% significance level warranting subsequent significant statistical analyses and results.

5.1. Agreement of respondents within each survey group

The replies from the respondents relating to the recommendations for executing MBIS were evaluated and classified into two respective groups of 'private group' and 'public group'. The mean ranking of each recommendation was assessed for all the respondents, and then each respondent group was calculated as portrayed in Table 2. The computed Kendall's coefficient of concordance (*W*) values are 0.111 (all respondent group), 0.148 (private group) and 0.073 (public group), all being statistically significant at 0.000.

The surveyed items on the questionnaire are more than seven, therefore, chi-square value should be used instead of *W* value. According to Siegel and Castellan (1988), the critical value of chi-square sought from the statistical table is 22.36 with the degree of freedom of 13 and allowable level of significance of 5%. The actual calculated chi-square values for the three respective groups were all extremely larger than the critical value of chi-square of 22.36 from the statistical table, i.e. 442.730 (all respondent group), 389.309 (private group) and 75.507 (public group).

The null hypothesis stating that "Respondents' sets of rankings are unrelated (independent) to each other within a particular group" should be rejected in this case. Hence there is significant level of concordance amongst the participants within each respondent group on the rankings of the recommendations for MBIS with adequate evidence. The test results have provided solid ground to confirm the collated data and responses from the respondents as valid and consistent prior to further statistical analysis.

Table 2. Mean ranking and Kendall's concordance test results for the recommendations or good practices for implementing MBIS (categorized by current residence of respondents).

No.	Recommendations or good practices for MBIS	All respondent		Private group		Public group	
		Mean	Rank	Mean	Rank	Mean	Rank
7	Establish detailed guidelines and clear standards for building inspection and remedial works under MBIS.	4.05	1	4.04	1	4.07	1
5	Offer more technical and financial assistance from the government to property owners to aid the execution of MBIS.	4.01	2	4.01	3	4.05	2
4	Enhance the public awareness on MBIS through different media.	3.98	3	4.03	2	3.92	3
14	Engage relevant professional institutions to review and improve the implementation of MBIS on a regular basis.	3.86	4	3.84	4	3.88	5
3	Devote more efforts and resources to train up the professions under the discipline of building inspection, management, and maintenance.	3.83	5	3.83	5	3.78	7
8	Establish an independent building maintenance fund as the capital for each building to implement MBIS in the long run.	3.82	6	3.78	6	3.91	4
11	Establish an Inspectors Registration Committee under BD to scrutinize and monitor the professional standards of inspectors.	3.77	7	3.77	7	3.76	8
6	Set up a specific division under the Buildings Department (BD) to execute MBIS and monitor the tendering and maintenance process.	3.7278	8	3.69	9	3.87	6
12	Those contractors already included in the register under the Buildings Department (BD) should also be enlisted in the category of registered contractors under MBIS.	3.7257	9	3.71	8	3.72	10
9	Those buildings with satisfactory safety ratings under the Voluntary Building Assessment Scheme (VBAS) launched by the Hong Kong Housing Society (HKHS) should be exempted from mandatory building inspection.	3.59	10	3.55	10	3.60	12
13	Raise the level of penalty on both fine and imprisonment to those property owners who do not carry out statutory building inspection and requisite remedial works.	3.55	11	3.44	12	3.73	9
10	Adopt the Building Safety and Condition Index (BSCI) developed by The University of Hong Kong (HKU) as an objective screening indicator to prioritize and determine the pool of target buildings requiring mandatory inspection apart from age consideration.	3.52	12	3.45	11	3.62	11
2	Shorten the inspection cycle from 10 years to 7 years or even five years in the long run.	3.21	13	3.12	13	3.35	13
1	Lower the age of the target buildings for mandatory inspection from 30 years old to 20 years old in the long run.	3.10	14	2.96	14	3.29	14
	Number (*N*)	315		226		89	
	Kendall's coefficient of concordance (*W*)	0.111		0.148		0.073	
	Actual calculated chi-square value	442.730		389.309		75.507	
	Critical value of chi-square from statistical table	22.36		22.36		22.36	
	Degree of freedom (*df*)	13		13		13	
	Asymptotic level of significance (*p-value*)	0.000		0.000		0.000	

H_0 = Respondents' sets of rankings are unrelated (independent) to each other within each group.
Reject H_0 if the actual calculated chi-square value is larger than the critical value of chi-square from table.

5.2. Ranking results of the recommendations for MBIS

The mean scores for the 14 recommendations for MBIS as given by all the survey respondents range from 3.10 to 4.05. Essentially, all the mean scores are larger than the middle value of 3 and close to each other leading to more skewness towards the "agree" option. Hence, the participants substantially agreed on the significance of the identified recommendations but with varying levels of concordance only. Moreover, the participants residing in private buildings rate the mean scores from 2.96 to 4.04 while those in public housing estates span from 3.29 to 4.07. The results reflect a greater disparity in the perceptions of the private group themselves (1.08) when compared with the public group (0.78) as a whole.

The results reflected that all the respondents ranked Item 7 "Establish detailed guidelines and clear standards for building inspection and remedial works under MBIS" as the top perceived recommendation for implementing MBIS with an overall mean value of 4.05 (Table 2). Chan (2008) opined that the ignorance of legal liability of multitudinous flat owners for and low building care awareness on periodic repair and maintenance towards their residential facilities may be attributed to inadequate statutory documentation and unclear implementation mechanism from the government. Chan and Choi (2015) advocated another major difficulty of MBIS in the scenario whereby property owners have not yet given sufficient guidelines and proper procedures in carrying out any prescribed repair and maintenance works subsequent to building inspection. Recently, the Hong Kong SAR Government have issued the "General Guidelines on Mandatory Building Inspection Scheme" (Buildings Department 2015) and "Code of Practice on Mandatory Building Inspection Scheme" (Buildings Department 2012b) for guiding the basic procedures of MBIS towards the community and industrial practitioners. The two sets of documents would serve as very useful references or guidelines for the individual tenants, building inspectors and maintenance contractors for carrying out the required statutory obligations under MBIS and clarifying any unnecessary ambiguities during execution.

The second most profound recommendation is Item 5 "Offer more technical and financial assistance from the government to property owners to aid the execution of MBIS" with an overall mean value of 4.01 (Table 2). It was also ranked as the third by the "private group" and the second by the "public group". While the majority of the property owners living in aged private housing are usually old with little or no educational attainment, they often encounter both technical and financial difficulties in conducting the prescribed examination and remedial works for their living premises. A public consultation report announced one of the primary hurdles for launching the maintenance of residential facilities to be the inspection and maintenance cost (Housing, Planning and Lands Bureau, 2007). Meanwhile, Kangwa and Olubodun (2003) identified inadequacy of requisite skills and technical know-how as a common inhibitor of facilities maintenance. The root causes of building neglect, as pointed out by Fung (2008), include a lack of motivation by property owners, their own ignorance and financial constraints. The low initiatives of owners and owners' ignorance may be caused by their insufficient knowledge about the prevailing building management and maintenance practices. Therefore, both technical advisory support and financial assistance schemes from the government (as listed in Figure 3) can be an effective way to cope with those problems to a considerable extent.

Item 4 “Enhance the public awareness on MBIS through different media” was regarded as the third most significant recommendation with an overall mean value of 3.98. It was ranked very high as well by both the "private group" (second) and the "public group" (third). The respondents perceived that MBIS had not been made well known in the Hong Kong community yet. Since a multitude of flat owners intuitionally perceive that no direct tangible evidence of advantages obtained from routine management and upkeep of their residential properties, they are reluctant or unwilling to devote more efforts on this matter (Chan and Choi 2015). Private building owners frequently exhibit a passive "wait-and-see" mindset till the defective elements are beyond their immediate control (Chan 2004). So the government should allocate more resources and dedicate more efforts to promote MBIS in town via various media such as advertisements on television and radio, government websites, social media platforms, promotional pamphlets dispatched at public venues, printed and online newspapers, together with advertised posters displayed at the entrance of old private residential buildings. A wider promotion of MBIS can efficiently transmit the key messages such as the main reasons, statutory requirements, and procedures of executing MBIS to the general public especially those residents living in dilapidated private premises, and remind them of their legal responsibility for taking good care of their living facilities.

5.3. Comparison of survey findings between private group and public group

The Spearman’s rank correlation test was then adopted to check for any apparent differences in the rankings of different recommendations elicited for MBIS between two respondent groups (SPSS, 2002). The correlation coefficient (r_s) of the rankings on the recommendations for MBIS is 0.916 between the “private group” and the “public group” with an actual significance level (*p-value*) of 0.000. Since the null hypothesis of no significant correlation on the rankings between the two groups should be rejected in this case, a significant correlation is detected on the rankings of MBIS recommendations between the “private group” and the “public group” with sufficient evidence.

For example, the same identical ranks are found on three items out of the total 14 surveyed items by the two respective survey groups as discovered in Table 2, that is, Item 7 “Establish detailed guidelines and clear standards for building inspection and remedial works under MBIS” (rank = 1), Item 2 “Shorten the inspection cycle from 10 years to 7 years or even 5 years in the long run” (rank = 13), and Item 1 “Lower the age of the target buildings for mandatory inspection from 30 years old to 20 years old in the long run” (rank = 14). Therefore, congruent perceptions especially on the rankings of these three recommendations were achieved by both the private group and the public group respondents. Furthermore, the associated rankings of the other 11 recommendations were observed to be very close to each other with the ranking difference of just one rank for five items, two ranks for four items and three ranks for two items. Hence both the respondents of the “private group” and the “public group” generally demonstrated very similar level of agreement on the rankings of the 14 identified recommendations for MBIS.

Table 3 provides the results of the Mann-Whitney U test which was carried out to detect any significant differences in the median values of each of the 14 recommendations for MBIS between the two survey groups. The actual calculated p-values of two recommendations are lower than the allowable significance level of 5%, whereas others are above the threshold of 5%. In other words, a significant difference was found in the median values of Item 1 “Lower

the age of the target buildings for mandatory inspection from 30 years old to 20 years old in the long run" between the “private group” (149.46) and the “public group” (177.82), together with Item 13 “Raise the level of penalty on both fine and imprisonment to those property owners who do not carry out statutory building inspection and requisite remedial works” between the “private group” (149.10) and the “public group” (174.05).

The statistical findings have generally manifested a higher level of agreement on the MBIS recommendations from the public group respondents than the private ones, as they rated them remarkably higher than the private counterparts (9 items out of total 14). These results are understandable because the current MBIS scheme does not cover the existing stock of public sector buildings. The "public group" survey participants may neglect or even feel indifferent to its influence on the community during implementation, as they would not be involved in any case. Conversely, the private sector would express multitudinous concerns about the implementation of MBIS in town than the public counterparts (Chan and Hung 2015). Since the private property owners are the unique stakeholders who would directly be influenced by the execution of MBIS, they rated the recommendations in a more prudent way so as to combat the impact on and disturbance to their daily life due to the launch of MBIS. In particular, they tend not to support the recommendation of lowering the age of the target buildings for mandatory inspection from 30 years old to 20 years old in the long run (Item 1) to make them more frequent for inspection with more unnecessary disturbance to them. Moreover, they are scared about the increased level of penalty regarding fine and imprisonment if they do not follow the statutory notices for undertaking a prompt inspection of their living facilities and the required repairs and maintenance under MBIS in future (Item 13). So, they assigned relatively lower ratings especially to these two items when compared with their public counterparts.

Table 3. Summary of the Mann-Whitney U test results on the recommendations or good practices for executing MBIS between the private group and the public group.

No	Recommendations or good practices for MBIS	Mean rank		*Z-value*	*p-value*[a]
		Private group	Public group		
1	Lower the age of the target buildings for mandatory inspection from 30 years old to 20 years old in the long run.	149.46	177.82	-2.597	0.009*
2	Shorten the inspection cycle from 10 years to 7 years or even 5 years in the long run.	152.90	170.96	-1.659	0.097
3	Devote more efforts and resources to train up the professions under the discipline of building inspection, management, and maintenance.	160.15	150.69	-0.951	0.341
4	Enhance the public awareness on MBIS through different media.	159.49	150.73	-0.914	0.361
5	Offer more technical and financial assistance from the government to property owners to aid the execution of MBIS.	156.92	157.20	-0.027	0.979
6	Set up a specific division under the Buildings Department (BD) to execute MBIS and monitor the tendering and maintenance process.	153.23	168.29	-1.431	0.152
7	Establish detailed guidelines and clear standards for building inspection and remedial works under MBIS.	156.12	161.04	-0.497	0.619
8	Establish an independent building maintenance fund as the capital for each building to implement MBIS in the long run.	154.33	163.82	-0.915	0.360
9	Those buildings with satisfactory safety ratings under the Voluntary Building Assessment Scheme (VBAS) launched by the Hong Kong Housing Society (HKHS) should be exempted from mandatory building inspection.	153.24	157.71	-0.423	0.672
10	Adopt the Building Safety and Condition Index (BSCI) developed by The University of Hong Kong (HKU) as an objective screening indicator to prioritize and determine the pool of target buildings requiring mandatory inspection apart from age consideration.	142.99	162.17	-1.923	0.054
11	Establish an Inspectors Registration Committee under the Buildings Department (BD) to scrutinize and monitor the professional standards of inspectors.	156.95	153.63	-0.330	0.742
12	Those contractors already included in the register under the Buildings Department (BD) should also be enlisted in the category of registered contractors under MBIS.	157.85	156.61	-0.123	0.902
13	Raise the level of penalty on both fine and imprisonment to those property owners who do not carry out statutory building inspection and requisite remedial works.	149.10	174.05	-2.313	0.021*
14	Engage relevant professional institutions to review and improve the implementation of MBIS on a regular basis.	155.06	154.85	-0.022	0.982

[a] ***p-value*** less than 0.05 showing statistically significant differences in the median values.

5.4. Comparison of survey findings between five organizational groups of respondents

The Spearman's rank correlation test was then adopted to check for any apparent differences in the rankings of different recommendations elicited for MBIS between any two of the five organizational groups of respondents (i.e. public client, private client, consultant, contractor and property management company). Among the 10 combinations of comparisons as listed in Table 4, the correlation coefficients (r_s) of the rankings are all greater than 0.8 with an actual significance level (*p-value*) of <0.002 each. Thus, the null hypothesis (H_0) can be rejected in this case. There is sufficient evidence to indicate collective significant correlations on the rankings of MBIS recommendations between any two of the five organizational groups, thus concluding that all the survey respondents shared generally unanimous perceptions on the rankings of MBIS recommendations established in this study with similar notions.

Table 4. Summary of the Spearman's rank correlation test results on the recommendations or good practices for executing MBIS between the five organizational groups of respondents.

Comparison of rankings	r_s	Significance level	Conclusion
Public client vs Private client	0.849	0.000	Reject H_0
Public client vs Consultant	0.909	0.000	Reject H_0
Public client vs Contractor	0.945	0.000	Reject H_0
Public client vs Property management company	0.853	0.000	Reject H_0
Private client vs Consultant	0.923	0.000	Reject H_0
Private client vs Contractor	0.800	0.001	Reject H_0
Private client vs Property management company	0.824	0.000	Reject H_0
Consultant vs Contractor	0.884	0.000	Reject H_0
Consultant vs Property management company	0.801	0.001	Reject H_0
Contractor vs Property management company	0.827	0.000	Reject H_0

where H_0 = No significant correlation on the rankings between two groups.

H_a = Significant correlation on the rankings between two groups.

Reject H_0 if the actual significance level (*p-value*) calculated is less than the allowable value of 5%.

6. Results of factor analysis on recommendations for MBIS

Factor analysis (FA) is a statistical tool used to evaluate the anatomy of inter-relationships among a vast set of individual factors and then to consolidate a relatively less number of underlying grouped factor groups which are adopted to symbolize the groups of several inter-related items (Norusis 1993; Hair *et al.* 2010). The collated survey responses in this study were further analyzed using factor analysis to establish the underlying clusters of the identified recommendations or good practices for executing MBIS. Factor analysis was carried out to consolidate the 14 individual recommendations for MBIS into four underlying clustered factor groups, which are labelled and illustrated in Table 5. The total percentage of variance explained by each factor group was applied to decide on the number of clustered factors for representing the set of data.

Table 5. Results of factor analysis on the 14 recommendations or good practices for executing MBIS.

No.	Recommendations or good practices for MBIS	Factor loading	Eigenvalue	Percentage of variance explained	Cumulative percentage of variance explained
Factor Group 1. Developing detailed guidelines for and providing more technical and financial support to MBIS implementation					
7	Establish detailed guidelines and clear standards for building inspection and remedial works under MBIS.	0.755	3.770	34.926	34.926
4	Enhance the public awareness on MBIS through different media.	0.693			
5	Offer more technical and financial assistance from the government to property owners to aid the execution of MBIS.	0.680			
8	Establish an independent building maintenance fund as the capital for each building to implement MBIS in the long run.	0.663			
3	Devote more efforts and resources to train up the professions under the discipline of building inspection, management, and maintenance.	0.653			
6	Set up a specific division under the Buildings Department (BD) to execute MBIS and monitor the tendering and maintenance process.	0.609			
11	Establish an Inspectors Registration Committee under the Buildings Department (BD) to scrutinize and monitor the professional standards of inspectors.	0.526			
Factor Group 2. Shortening the inspection cycle and lowering the age of target buildings for mandatory inspection					
2	Shorten the inspection cycle from 10 years to 7 years or even 5 years in the long run.	0.848	1.758	22.556	57.482
1	Lower the age of the target buildings for mandatory inspection from 30 years old to 20 years old in the long run.	0.847			

No.	Recommendations or good practices for MBIS	Factor loading	Eigenvalue	Percentage of variance explained	Cumulative percentage of variance explained
Factor Group 3. Soliciting support to MBIS implementation from relevant professionals and contractors					
14	Engage relevant professional institutions to review and improve the implementation of MBIS on a regular basis.	0.729	1.316	12.398	69.880
13	Raise the level of penalty on both fine and imprisonment to those property owners who do not carry out statutory building inspection and requisite remedial works.	0.655			
12	Those contractors already included in the register under the Buildings Department (BD) should also be enlisted in the category of registered contractors under MBIS.	0.614			
Factor Group 4. Complementing MBIS with other related local building assessment schemes or measures					
9	Those buildings with satisfactory safety ratings under the Voluntary Building Assessment Scheme (VBAS) launched by the Hong Kong Housing Society (HKHS) should be exempted from mandatory building inspection.	0.855	1.045	8.462	78.342
10	Adopt the Building Safety and Condition Index (BSCI) developed by The University of Hong Kong (HKU) as an objective screening indicator to prioritize and determine the pool of target buildings requiring mandatory inspection apart from age consideration.	0.644			

Notes:
Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy: 0.787
Barlett's test of sphericity:
Approximate chi-square (ψ) value: 935.423
Degree of freedom: 91
Significance level: 0.000
Cronbach's alpha (α) reliability coefficient: 0.761

According to Norusis (1993), factor analysis involves a two-stage process: factor extraction and factor rotation. Principal components analysis for factor extraction with Promax rotation and Kaiser normalization was chosen to seek the underlying grouped factors of the 14 individual recommendations for MBIS by means of the SPSS FACTOR program version 22.0. The Promax rotation method has been applied in many research studies (e.g. Lam *et al.* 2008; Karna *et al.* 2009; Chan *et al.* 2012; Chan and Choi 2015), being one of the most widely adopted oblique rotation techniques for deriving theoretically more meaningful, interpretable and reliable factors.

The Kaiser-Meyer-Olkin (KMO) test measures the adequacy of a sample by comparing the magnitudes of the partial correlation coefficients, with values between 0 and 1. As indicated in Table 5, the KMO value derived in this study is 0.787, which is significantly higher than the acceptable threshold of 0.50 (Kaiser 1974; Field 2005). The Barlett's test of sphericity was adopted to determine whether the correlation matrix gives an identity matrix (i.e. no relationship among the items) or not (Pett *et al.* 2003). The Barlett's test of sphericity for this study gives a large chi-square (ψ^2) value of 935.423 with a very small corresponding significance level (*p-value*) of 0.000. Hence, the population correlation matrix is not an identity matrix, with the overall Cronbach's alpha (α) reliability coefficient of 0.761 for the 14 recommendations for MBIS which is also greater than the allowable threshold of 0.70 (Norusis 1993). Thus it can be evidenced that factor analysis is appropriate for the collated data and further analysis can be launched more confidently and reliably. Lingard and Rowlinson (2006) suggested the use of a ratio of 1:5 (number of variables to sample size) requirement before proceeding with factor analysis. There are 14 recommendations on MBIS for the study with 340 sample responses gleaned from the survey participants which is much more than the minimum requirement of sample size for factor analysis (14 items x 5 samples = 70 samples).

Factor analysis brought up a total of four underlying clustered factor groups with the total percentage of variance explained of 78.3% which is significantly higher than the acceptable minimum of 60% as per Malhotra (1996) and Hair *et al.* (2010). Any other factor groups with eigenvalues of less than 1.0 are abandoned as being perceived less important than the four extracted factor groups (Hair *et al.* 2010; Chan and Hung 2015). The 14 individual items of recommendations were all subsumed in one of these four underlying clustered factor groups. Figure 4 illustrates a scree plot of total variance accompanied by each of the clustered factor groups which has evidenced the appropriateness and sufficiency of a four-factor model after factor analysis.

With a view to assisting in the explanations on the findings generated from factor analysis, a representative and collective label is required for the clustered groups of individual factors with higher factor loadings (Chan and Choi 2015). Nevertheless, it must be pointed out that the recommended name of each factor group is subjective, and a different name may be suggested by others.

6.1. Underlying clustered factor groups of recommendations for MBIS

Factor Group 1. Developing detailed guidelines and providing more technical and financial support to MBIS implementation

Factor Group 1 comprises seven items focusing on distinct aspects of implementation details of MBIS such as guidelines and specifications for building inspection and repairs, technical

and financial support, efforts and resources for training up professionals, promotion on MBIS and committees for monitoring the scheme. The development of detailed guidelines and clear standards of inspection and repairs on existing private buildings would be essential in facilitating a smooth, efficient implementation of MBIS (Buildings Department 2015), and avoiding inconsistent standards of different service providers (Buildings Department 2012b). These useful guidelines and standard codes of practice would be very instrumental to the property owners, building inspectors and maintenance contractors in executing the prescribed statutory tasks under MBIS, and alleviating any potential discrepancies which may hamper the procedures for executing MBIS from inspection stage to culmination of required repair works.

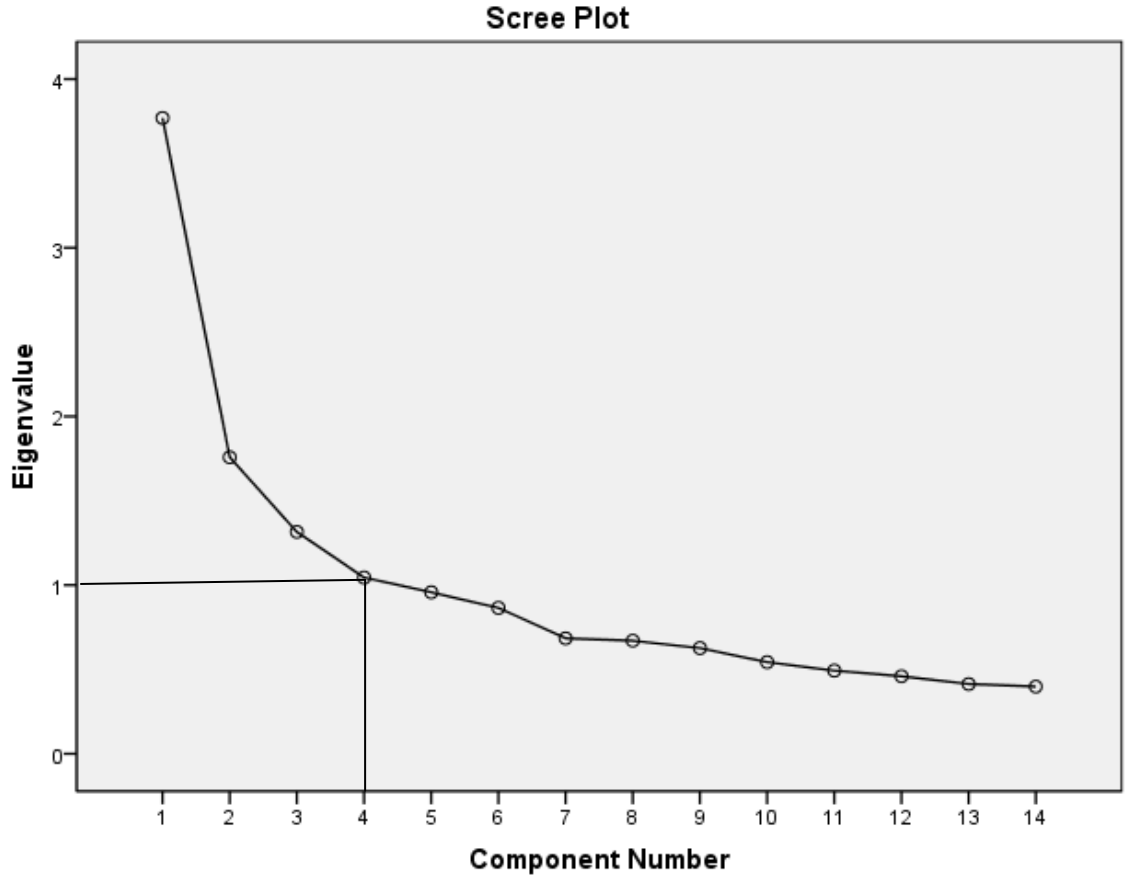


Figure 4. Scree plot of the 14 recommendations for MBIS.

Since the majority of the property owners currently residing in old private premises are the elderly with low education level, the deficiency of requisite technical knowledge and skills is frequently regarded to be a significant barrier to prompt care of such facilities (Kangwa and Olubodun 2003). Moreover, they may not have enough financial resources to afford the costs incurred for prescribed building inspection, and the subsequent rectification works for their buildings after inspection. Therefore, the government should render more concrete support (whether technical or financial) towards the tenants in form of advisory consultations and subsidy/loan schemes to help with the operation of MBIS.

Enhancing the public awareness on MBIS in town through different media, for example, advertisements on television and radio, government websites, social media platforms,

promotional pamphlets dispatched at public venues, printed and online newspapers, together with advertised posters displayed at the entrance of old private residential buildings. These promotional channels would be useful in enhancing various property owners' awareness and concerns of statutory building inspection, management and maintenance. On the other hand, the Hong Kong Institute of Surveyors put forward a proposal to the Development Bureau in June 2015 for setting up a statutory body named the "Building Repair and Maintenance Authority (BRMA)". It aims to provide a recognized list of consultants and contractors, and publish industry information such as prices, standards of service, and the performance records of each building works company, so as to help scrutinize and monitor the professional standards of registered inspectors and the quality of building maintenance contractors (Hong Kong Institute of Surveyors 2015).

Factor Group 2. Shortening the inspection cycle and lowering the age of target buildings for mandatory inspection

Factor Group 2 consists of two recommendations on MBIS. The first recommendation is to reduce the inspection cycle from 10 years to 7 years or even five years in the long run. Preferably, when the inspection cycle is more frequent such as every five years, any defects can be sought and handled earlier. However, too frequent building inspections and repairs will generate heavy financial burdens on and severe disturbance to building owners. To make the proposed scheme more practical and balanced between public safety and a fiscal load of property owners, the inspection cycle of every seven years would be appropriate for consideration and review by the government authorities.

The second recommendation is to lower the age of the target buildings for mandatory inspection from 30 years old to 20 years old in the long run. To safeguard public safety, it was suggested to lower the age of target buildings to 20 years old. Any residential premises reaching the age of 10 years old are subject to statutory inspection in Singapore, while it is a mandate for regular inspection of all kinds of buildings in both New York City and City of Chicago irrespective of their ages (Chan *et al.* 2014). Different kinds and levels of building defects such as falling off of concrete debris, structural or non-structural cracking, debonding of finishes and mosaic tiles from walls, etc are routinely detected with the buildings around 20 years old (Hui *et al.* 2008; Buildings Department 2011). So, it would be advisable to identify these defects at an early stage, followed by immediate rectifications.

Factor Group 3. Soliciting support to MBIS implementation from relevant professionals and contractors

This factor group includes three items: (1) Engage relevant professional institutions to review and improve the implementation of MBIS on a regular basis; (2) Raise the level of penalty on both fine and imprisonment to those property owners who do not carry out statutory building inspection and requisite remedial works; and (3) Those contractors already included in the register under the Buildings Department (BD) should also be enlisted in the category of registered contractors under MBIS. As the situation of building deterioration in Hong Kong may vary with time, it is vital to review and update the implementation mechanism of the scheme by engaging relevant professional institutions (e.g. Hong Kong Institute of Architects, The Hong Kong Institution of Engineers, Hong Kong Institute of Surveyors and Hong Kong Institute of Construction Managers) regularly to reflect on the contemporary issues and prevailing building regulations. It can ensure the practicability and effectiveness of MBIS

during implementation in future. Moreover, in order to eradicate the elusion of statutory liability for building inspection and repair of private property owners and their weak building care culture, it is necessary to impose heavier penalties on both fine and imprisonment as a kind of deterrent to those non-compliants. This recommendation may be treated as a passive measure for facilitating the smooth execution of MBIS in town.

Registered contractors (RCs) under MBIS are to be appointed to execute the requisite remedial and repair works subsequent to building inspection (Buildings Department 2012a). Since the deterioration of old residential facilities in Hong Kong has become more and more serious over the recent years, there would be an expected surge in need of building maintenance contractors year by year. Hence it was suggested that those contractors already included in the register of the Buildings Department (BD) should also be enlisted as the registered or eligible contractors under MBIS, with the purpose of ensuring an adequate supply of competent contractors to meet the future market demand for undertaking the prescribed repair and rectification works after inspection (i.e. 2,000 buildings per year). Moreover, property or facility management companies can seek appropriately qualified contractors from the BD register to undertake various types and scales of repair/maintenance works more easily and reliably.

Factor Group 4. Complementing MBIS with other related local building assessment schemes or measures

A successful implementation of MBIS would be enhanced by complementing with other relevant local building assessment schemes or measures. One of them is that the Hong Kong Housing Society (HKHS) worked very closely with the BD and related professional bodies to develop and operate the Voluntary Building Assessment Scheme (VBAS) intended to be launched about six months prior to the official announcement of executing MBIS on 30 June 2012 (Hong Kong Housing Society 2005). VBAS aims to provide an incentive for achieving better management and maintenance of private residential buildings, and improve the living environment based on voluntary initiatives. The Buildings Department (BD) will accept those buildings certified under VBAS for having satisfied the statutory requirements under MBIS in the corresponding cycles of inspections. Therefore, those buildings accredited with satisfactory safety ratings under VBAS would be exempted from mandatory building inspection by BD for ten years after the award date of certification by HKHS (Hong Kong Housing Society 2010).

A new building classification system was recommended to the government by the researchers from The University of Hong Kong (HKU) to tackle long-term building deterioration. The Building Safety and Condition Index (BSCI) establishes the degree to which a building can safeguard with respect to physical and mental health risks, and the quality of building services and operations, for example, structural maintenance will be adopted as the evaluation standards. Each building will be assessed and assigned a BSCI grade with the four ratings (A = very good; B = average / good; C = fair; and U = unsatisfactory or unclassified). The building classification system can then be served as an objective measure of potential property price in the market and priority of redevelopment in urban renewal (The University of Hong Kong 2005). The government may also adopt the developed BSCI index as an objective screening indicator to prioritize and determine the scope of intended dilapidated buildings requiring statutory inspection other than age consideration.

6.2. Ranking results of the underlying clustered factor groups of recommendations for MBIS

After the classification of the underlying clustered factors, they were ranked in descending order according to the Factor Scale Rating as applied by Cheung (1999), Hair *et al.* (2010), Chong and Zin (2012), Chen (2013), and Chan and Hung (2015). The Factor Scale Rating of a particular clustered factor group was calculated based on the sum of the means of the individual items contained within that factor group divided by the total number of items contained within that factor group. This would help with the understanding of the perceptions of the respondents based on mean scale rating. Table 6 gives the ranking results of the four underlying clustered factor groups containing the 14 individual recommendations that the respondents discern Factor 1 "Developing detailed guidelines and providing more technical and financial support to MBIS implementation" as the most significant grouped recommendation for MBIS. Ranked next to it is Factor 3 "Soliciting support to MBIS implementation from relevant professionals and contractors", followed by Factor 4 "Complementing MBIS with other related local building assessment schemes or measures", and finally Factor 2 "Shortening the inspection cycle and lowering the age of target buildings for mandatory inspection" in relative terms".

Table 6. Ranking results of the four underlying clustered factor groups containing the 14 individual recommendations for MBIS.

No	Underlying clustered factor group	Factor scale rating	Ranking
1	Developing detailed guidelines and providing more technical and financial support to MBIS implementation	3.884	1
2	Shortening the inspection cycle and lowering the age of target buildings for mandatory inspection	3.155	4
3	Soliciting support to MBIS implementation from relevant professionals and contractors	3.712	2
4	Complementing MBIS with other related local building assessment schemes or measures	3.555	3

7. Conclusions

In Hong Kong, the problems with improper maintenance of old private buildings have not yet been resolved efficiently over the years. However, the trend of building ageing and dilapidation has been widely observed everywhere. Thus, the Hong Kong SAR Government has decided to introduce the Mandatory Building Inspection Scheme (MBIS) for rectifying the deteriorating situation of these dilapidated private premises. The key recommendations or good practices for executing MBIS were identified, analyzed and discussed in this paper. Altogether, 14 individual statements depicting various recommendations for MBIS were developed, and the collated survey responses from different intended practitioners were ranked and analyzed. Moreover, the comparison of ranking results and the evaluation of any statistical significance in the level of agreement between the two groups of respondents living in private premises and public housing estates were also explored and illustrated in this paper.

The industrial practitioners believed that there are still plenty of rooms for improving the current status of execution of MBIS by the government based on the survey results. They can be reflected by the top 3 recommendations including: (1) Establishing detailed guidelines and

clear standards on the requirements of building inspection and repair works under MBIS; (2) Offering more technical and financial assistance from the government to property owners to aid the execution of MBIS; and (3) Enhancing the public awareness on MBIS through different media. The effectiveness of MBIS heavily relies on the leading role of the government. Well-established detailed guidelines and clear standards, adequate advisory support to individual flat owners and widespread promotion in town can create a strong impetus for driving the success of MBIS. It is thus anticipated that the government will deliberate on and adopt those effective recommendations or good practices elicited from the survey to facilitate the smooth execution of MBIS as far as possible in near future (e.g. setting up a statutory body named the "Building Repair and Maintenance Authority (BRMA) for scrutinizing and monitoring the professional standards of registered inspectors and the quality of building maintenance contractors which is somewhat similar to Item 6 "Setting up a specific division under the Buildings Department (BD) to execute MBIS and monitor the tendering and maintenance process" in nature). Meanwhile, factor analysis was also utilized to crystallize four underlying clustered factor groups of recommended strategies for MBIS collectively.

Notably, MBIS remains at its germinating stage of growth in Hong Kong, and the tempo of execution has been gaining drastic momentum over the recent years. It is hoped that the research study has stimulated a wider debate on the recommended improvement strategies or measures for implementing MBIS in both a local and international context for reference by the community at large and the construction professionals in particular. With the identified effective recommendations taken up by different major stakeholders comprising of government officers, construction practitioners, building owners and the community, MBIS will be significant and useful in combating the long-lasting problems of building ageing and decay in Hong Kong, and mitigating or even eradicating any kinds of associated accidents or tragedies in future. As prevention is better than cure, there is a strong recommendation that a similar scheme to MBIS should be established in other developed countries or regions for implementation worldwide to strive for excellence in building safety and health. This is in line with the sustainability principle of providing a better living and working built environment for the community as a whole.

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Paper Title: Sustainable Building Maintenance for Safer and Healthier Cities: Effective Strategies for Implementing the Mandatory Building Inspection Scheme (MBIS) in Hong Kong

Highlights

- Urban decay and building deterioration have become a prime concern in Hong Kong.
- This paper aims to determine and explain effective recommendations for executing MBIS.
- Such findings have provided more hands-on knowledge about MBIS for implementation.