

Responsibility and Accountability of Stakeholders in the Construction Industry

By Dato' Ir. Fong Tian Yong

The Board of Engineers Malaysia recently prepared a Position Paper to identify issues and weaknesses in the construction industry supply chain in respect of building failures and fatal site accidents and proposed recommendations with a view to minimise such mishaps.

Building failures and fatal site accidents are common in the construction industry. Construction site accidents account for approximately 10% of the total accidents of workers in general. The high profile case of the Highland Tower collapse in 1993 and a series of landslides claiming several lives prompted authorities to beef up the Regulations and Guidelines on Hill Sites and Highlands Development in 2010 that have given more emphasis to the planning aspects of hill slopes.

However, the recent spate of building failures either during construction, occupation or demolition has created great public concern with wide publicity in the press. Structural collapse which does not incur loss of life or physical injury may not be noticed and can be easily remedied on site, but site accidents involving life or injuries are of concern to the public, and they are covered in this position paper for review and recommendation.

With the wide negative publicity of stakeholders involved in the construction industry, even for minor events such as falling ceilings or leaking roofs of a public building, the Board of Engineers Malaysia (BEM) decided to form a Working Group (WG) to study the whole supply chain of the construction industry. The study will look into the stages of development and the stakeholders involved, the relevant laws and policies related to them, possible causes of failures and recommendations. Literature reviews

will also be carried out on past cases of building failure related to the above.

Working Group of Responsibility and Accountability of stakeholders in construction industry

The WG was headed by Dr Ir. Tan Yean Chin, Chairman of Professional Practice Committee of BEM, with representatives from the construction industry consisting of KPKT, IEM, ACEM, CIDB, PSDC, MBAM, DOSH, PAM, LAM and BEM.

As the scope for this subject is broad, the WG decided to limit the scope to the following types of failure:

Types of failure

- a) Building failures of all public buildings involving structures or services;
- b) Building failures of other buildings/ structures involving life or injury to people or an incident reported in the press;
- c) Construction site accidents involving personal injury or loss; and
- d) Serviceability problems of public buildings which create nuisance and interruption to the users (internal piping burst, parliament roof leaks etc).

Stakeholders

- a) Developers/Project proponents
- b) Planners
- c) Architects
- d) Engineers
- e) Contractors
- f) Tradesmen
- g) Site Supervisors
- h) PTD (land officers).

Supply Chain of the Construction Industry

The supply chain of the construction industry involves the following phases:

- a) Development project inception,
- b) Land conversion,
- c) Planning approval,
- d) Building plan approval (including earthworks utilities/infra),
- e) Procurement process,
- f) Construction,
- g) Building delivery (Certificate of Fitness or CFO/Certificate of Completion and Compliance or CCC),
- h) Maintenance and management,
- i) Periodical inspection, and
- j) Demolition.

At each of these phases, different stakeholders and different regulatory bodies are empowered under different applicable laws. This review will examine each of these phases to identify common or possible causes of building failures or site accidents.

Common/Possible Causes of Building Failures or On-site Accidents

From literature reviews, past failures can be attributed during any phase of supply chain of property development to any of the stakeholders stated above although the probability of occurrence differs. For ease of documentation, the causes of failure/incidence are categorised in Figure 1.

Development Project Inception Stage

a) Project proponent carrying out structure work without professional input within Local Authority areas or outside Local Authority areas.

Street, Drainage and Building Act (SDBA) 1974 and the Uniform Building By-laws (UBBL) regulate Local Authority areas whereas construction works outside Local Authority areas are not within their jurisdiction. In fact, many structures outside Local

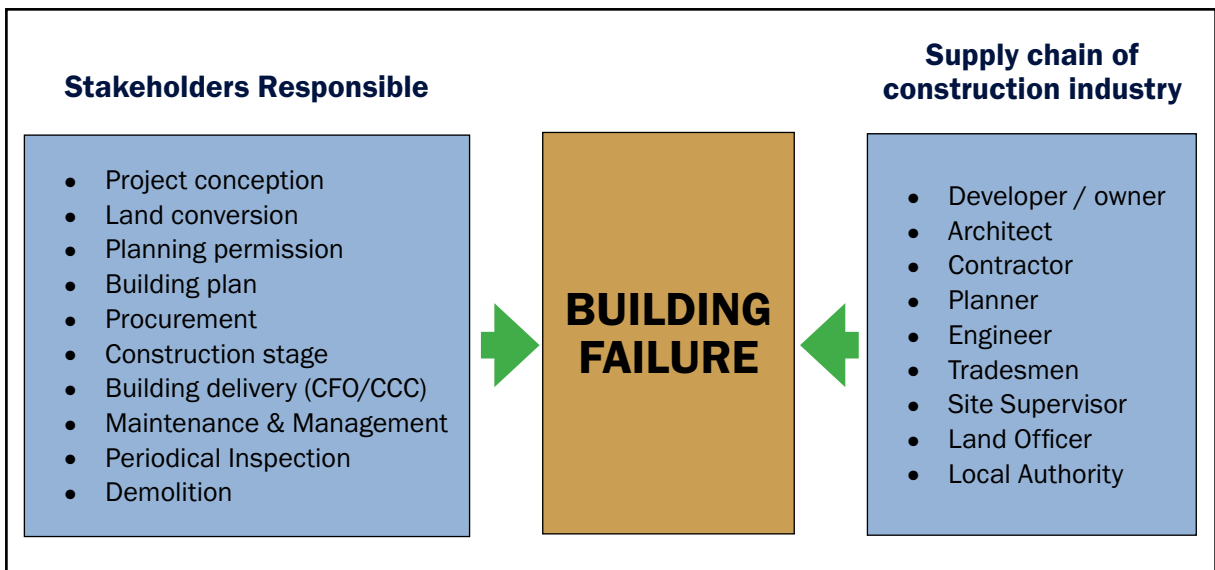


Figure 1

Authority areas, such as rural village houses, agriculture buildings (lately 3-4 storey swiftlets houses), bridges, etc., were built without approval from a Local Authority. As of 2010, only Perlis, Kedah and Melaka had gazetted every inch of their land under a Local Authority.

The recent collapse of a canopy bridge in Perak in 2009 claiming three students' lives while on outdoor activities is one such case where a donor appointed a contractor to build the canopy bridge without input from a Professional Engineer (PE) or plans submitted for Local Authority approval.

The landslide at the Cameron Highlands farm in 2003 was due to the construction of ponds at mid-slope by farmers without professional advice.

It would appear from these cases that project proponents take things for granted relying on a contractor's experience or they follow examples of what was built in other places without due regard to the geotechnical conditions. The same can happen in a house extension or renovation where enforcement from a Local Authority is lacking.

There are also instances where developers call the shots in deciding the final design or construction method and overrule the consultant's recommendations in the development phase. Some common problems are earth fills for low-cost housing where the depth of the fill for each compaction can be as little as a metre or so. The Ministry of Housing has received many complaints of such nature particularly for low-cost housing because of the low profit margin when compared with medium to high cost housing areas.

b) Short and unreasonable time lines to complete complex structures

Several structure failures have been caused partly because of the short time frame to complete the project where intricate works have to be carried out round the clock by same team of skilled and unskilled workers and supervisors. The structural failure of Sekolah Menengah Majidee Johor Bahru in 1988 under the 'Projek Segara' was mainly due to rushed works at the expense of proper site control and monitoring. Classroom floor screeds were dislodged when the school was opened for use. Investigation showed some core samples of the slab below 10 kN. Similarly, installation works, such as space frames require concentration and attentive

effort. Errors in one component or member can lead to undue stresses in other areas. Some local stadium roof collapses are such examples.

Recommendation

- a) *Promote public awareness on the risks of structural works without an engineer's advice through education, campaigns or village leadership training since many of these problems occur in rural areas. Pamphlets may be produced similar to the types used in Hong Kong to educate house owners living near hill slopes with the risk of landslides.*
- b) *Strengthen SDBA and UBBL to cover a wider area outside Local Authority areas.*
- c) *Stakeholders must insist on a reasonable time line for project completion and avoid night work with the same crew to avoid fatigue, loss of concentration and ineffective supervision.*

Land Conversion Stage

a) Land Offices approving development applications without considering the geo-hazards in particular areas especially farming activities on hill slope areas

The Land Office with the authority to approve land conversions is the first check point for the whole property development approval process – land conversion, planning approval, building plans, etc. It is therefore very important that Land Offices understand the risk implications of a site against possible failures in relation to the geotechnical, geological or environmental setting. The approval of several property developments at Bukit Antarabangsa by the Land Office even though it had several unstable slopes, set in train several mishaps.

Recommendation

- a) *All land conversion applications on high hill slopes and sensitive areas should have a brief evaluation by a PE with the relevant experience in geotechnical engineering on the site's suitability for the proposed development.*

Planning Approval Stage

a) Approving plans with structures on unstable ground hazard areas

Planning is about the arrangement of a built environment. The planning authority is guided by the Town and Country Planning Act and several Planning Guidelines to evaluate planning submissions prepared by town planners or architects for approval. Again, some understanding of the site is important as there are still projects being approved at unsafe hill sites or ex-dump sites. Examples of these are the recent Klang Valley bungalow project on hill slope (steep slope with previous landslide in 2008) and the Lembah Subang Flats and PPR Apartment with the threat of methane gas arising from a thick waste dump beneath the ground.

b) Approving a build environment on a flood prone plain

Development projects on flood prone areas such as Taman Sri Muda create social problems for the residents and occupants. They also create additional burden on the local Government which has to install and maintain huge pumping facilities to pump out floodwater on a periodical basis.

Recommendation

a) Planning authorities should be careful when approving planning permission for new projects. Where hill slopes or sensitive areas are involved, for example ex-dump sites, wetlands and peat soil areas, they should insist on comments from PEs with relevant experience. Alternatively, town planners submitting plans for planning permission approval must attach an engineer's report on ground suitability for hill slopes or sensitive areas.

Building Plan Approval Stage

a) Architects submitting building plans with structural elements

Architects have been submitting building plans with structural elements such as roof trusses,

lintels or high walls while there is no clear line drawn yet on the eligibility of architects and engineers to submit plans for some structural elements. The list of projects/components issued jointly by the Board of Architects and Board of Engineers places roof trusses under List C, meaning both architects and engineers can submit plans for these. The Streets, Drainage and Building Act defines structural elements as those components of a building that carry moment and force. Although there is no reported failure of short roof trusses for houses, the long span roof truss is beyond an architect's competence. In the case of the timber roof truss failures involving long spans and usage of splices at a Kulim property development project, both the architects and engineers tried to distant themselves from the responsibility.

b) Incompetency of design engineers

There are several cases where design errors have been detected during and after construction, such as a trade centre in KL, a school project in Cheras, a Government training centre building in Bangi, a private college in Petaling Jaya, a linkway bridge in Petaling Jaya, among others. In the case of two Government projects, the design engineers had only a few years' experience and had just started their Engineering Consultancy Practice (ECP) when they obtained PE status. Error in design is a common cause where wrong parameters are used or wrong analyses are applied on a structure.

Some projects were awarded to consultants without the required experience and resources to undertake complex structures such as the space frames for big complexes.

There are also cases discovered by BEM Professional Practice Committee where electrical engineers signed for civil and structure plans.

c) Insufficient soil investigation for geotechnical related work

There have been cases where little or no sub-surface investigation was conducted for structures in a geotechnical setting. The retaining wall failures at a Kulim housing project revealed the absence of any soil investigation.

Recommendation

- a) *Review the joint list of project submissions for architects and engineers as agreed by the two professional boards, Board of Architects and Board of Engineers, providing clear lines of authority and responsibility between architects and engineers in respect of designs involving structural elements.*
- b) *PEs must have a minimum number of years of relevant experience (e.g. in engineering consultancy services) before being allowed to act as a Submitting Person for structural plans to the Local Authority.*
 - *select consultant based on Quality Based Selection (QBS) process such as International Federation of Consulting Engineers' (FIDIC) guidelines to ensure that only competent consultants with relevant experience are selected.*
 - *Design of complex structures or geotechnical works must be vetted by accredited checkers registered with BEM.*
- c) *Review UBBL to require submission of structural plans to be accompanied by a soil investigation and geotechnical report by PEs with relevant geotechnical engineering experience for works in a geotechnical setting.*
- d) *Take stern action against any PEs who practice beyond the field of engineering that they are competent in.*

Procurement Process Stage

a) *Incompetent and inexperienced contractors*

As contractors are the persons who actually carry out the construction works, it is important that they are qualified to handle the job depending on its complexity. There are prevailing requirements for the registration of contractors depending on their classification by CIDB. However, in practice, many contractors do not seem to possess the necessary qualifications and experience as evident by the number of structural failures due to contractor negligence since the consulting engineer cannot be on site full time.

Recommendation

- a) *Selection of contractor for complex works should be based strictly on the contractor's experience, support of skilled technical staff and financial standing.*
- b) *Costing should be included into the 'Preliminaries -' of the contract for the cost of ensuring safety and complying with the provisions of the Occupational and Safety Act 514 (OSHA), Factory and Machinery, Act 139 and the Rules on requirements on Site Safety Supervisors under Factories and Machinery (Building Operators and Works of Engineering Construction) (Safety) 1986.*

Construction Stage

a) *Incompetent Clerk of Works as a Site Supervisor or Inspector of Works*

A Clerk of Works (COW) was formerly engaged for construction work to act on behalf of either the consultant or contractor. There were several cases of failures that were attributed to the incompetency of supervisors. CIDB now registers them as Site Supervisor (SS) and BEM registers them as Inspector of Works (IOW). Since engineers cannot be on site full time for most projects, it is therefore important that an SS or IOW possesses the right competency to undertake the task to ensure structures are constructed according to plans and engineering principles.

Some developers second their office staff who might not be qualified to act as an IOW nor have sufficient time for site supervision.

b) *Insufficient Site Supervisors*

It is common for Government projects to be supervised by a skeleton strength of SSs. The case of structural failures at SM Majidee Johor Bahru in 1988 points to the lack of supervision where a technician had to supervise four schools under the 'Projek Segara' scheme and concreting was allowed at night. During the investigation by JKR HQ, for a similar project across the Causeway, a Jurong Town Corporation housing flats in Jurong had allocated four technicians for a single project.

c) Temporary works overseen by an incompetent contractor/supervisor or without an engineer's input for works involving structural inputs

Temporary works failures such as temporary retaining structures for a deep trench or basement excavation, struts, formworks, scaffolding, catch platforms, cranes, etc., are common on construction sites. Contractors tend to take the easy way out since it is not part of the final product. Many of these are performed without an engineer's input and are based on the contractor's experience on a trial and error basis. A few cases of trench cave-ins claiming the lives of construction workers prompted DOSH to produce guidelines on work safety for trenching works.

d) Removal of consultants' scope of service in the construction stage

By-law 5 of UBBL stipulates that no erection of building can proceed unless the Submitting Person (the PE who submitted the structure plan) undertakes the supervision of that building. However, some Government agencies and developers remove the scope of services in the construction stage from the consultants and take over the role of site supervision or involve only the minimum services of the consultants.

e) Contractor's fraudulent acts resulting in inferior products/unsafe construction

There are many cases of contractors who cheat on materials and compromise on workmanship. This can result in weaker concrete strength and durability, less stable structures, regular breakdown of building services, water seepage on walls and floors, etc.

f) Inferior quality of building materials used

A few cases have been highlighted in the media that relate to inferior building materials being used. For example, incidents of pipe bursts at newly completed Government buildings. One of the buildings had an incompatible end piece of PVC pipes that gave way when the main pipes were under pressure, thus flooding the floor and damaging the ceiling.

g) Incompetent or inexperienced tradesmen engaged on site

Incompetent tradesmen are also contributors to minor failures in buildings such as piping, wiring, sanitary plumbing, waterproofing. The current system of registration of tradesmen by CIDB is good but more often than not, many construction works are being sub-contracted to other unregistered tradesmen who may not have the basic knowledge of the trade and are also not directly responsible to the main client. In the case of a housing project in Kuala Lumpur, excessive leakage occurred in the plumbing system in about 30 houses in various areas of the houses as the plumbers did not consider the fact that a booster pump was installed at every house by the developer. The same problem happened in a newly completed building in Kuala Lumpur where a non-compatible end-piece was connected to a piping system.

h) Lack of safety measures on site

The standard of safety measures on site including that of the employment of a competent safety officer is often not on the priority list of the contractor. It is also an area where cost cutting tends to be exploited. Some site accidents can be traced to the lack of basic safety provisions for necessary safety equipment.

Recommendation

- a) *Set a minimum ratio (e.g. number of personnel) of SS against the size and complexity of the projects and define the category of the SS required.*
- b) *Review existing guidelines on temporary works in respect to structural stability and hazards to the public. Identify any gaps in the guidelines and enhance enforcement.*
- c) *Make key personnel of all contractors (e.g. directors, key important posts) personally responsible and punishable through amendments to the CIDB Act or other regulations on negligence and fraudulent acts resulting in inferior products (e.g. cheating,*

bad workmanship, defective or inferior quality materials used, negligence, etc.)

Building Delivery (CFO/CCC) Stage

a) Certifying without checking/visiting the project

There have been a number of complaints from Local Authorities that the Submitting Person who signed the Form E for the application of a CFO had done so without visiting the site and some did not even know the location of the site for small projects in rural areas.

The case of the structural failure of Government housing flats (a prefab system from a Korean company) is an example where the local consultant certified Form E without active involvement in the project.

Recommendation

- a) Regular reminders to PEs on their responsibility and accountability when certifying works and publicise cases in BEM publications or press conferences by the BEM/Minister.*
- b) Take stern action against PEs who do not act professionally or ethically.*
- c) The contractor's column in all Form Gs where contractor column appears, must be signed by the contractor's company director and the site manager jointly.*
- d) Take stern action against individuals (e.g. directors and site/project managers) of contracting companies that act irresponsibly or fraudulently.*

Extension and Renovation Works

a) Performing extension or renovation works without checking on design capacity of structure

This is a common feature whereby an owner renovates a structure without the engagement of an engineer to check against its carrying capacity due to additional loading. Certain internal renovations need not require approval from a Local Authority even if it involves extensive material

change and it is not noticeable to authority. Examples of such failures are the Singapore New World Hotel collapse in 1986 and Korea's Sampoong building in 1995, where changes to the use of the buildings introduced extra loading due to air conditioner units, water tanks, exterior tiling, raised floors, etc.

Recommendation

- a) Strengthen UBBL to make it a requirement to submit structural plans to the Local Authority for endorsement of any renovation that incurs extra loading. This will imply the engagement of an engineer as only a PE can sign on the structure plan. Since it is only to deposit the plan with Local Authority, it does not impose any bureaucracy in the process.*

Maintenance and Management Stage

a) Incompetent technical personnel handling refurbishment and or repair structural works

Repair or refurbishment works are often overlooked from the structural safety aspect whereby works are often carried out by incompetent supervisors or left to the contractors themselves. In the case of the Johor Bahru Lumba Kuda 16-storey flats' roof, a 500,000 litre pressed steel water tank collapsed in 1993 killing a youth and damaging several cars, and residents were forced to move out for a day. Although the tank was just repaired by replacing new struts, the corroded cleats joining the strut and the tank plate were not replaced. Hacking and re-joining the struts and the plate made the joints weaker and they failed two weeks after the completion of the repair. The technical assistant, as the most senior technical officer from Jabatan Perumahan Negeri had no proper training or experience to pre-empt such risk and relied upon contractor's experience to do a proper job.

Recommendation

- a) Repair of structural elements should be managed by qualified technical personnel. For complicated structures or slopes, PEs must be*

engaged. Since incidences of such nature affect mainly complexes or big buildings, owners and the managing team should be educated on this risk as part of their work manual.

Periodical Inspection Stage

a) Failure to perform periodical inspection of a building by the owner

Buildings deteriorate over the span of their life time. Corrosion affects reinforcements due to carbonation or concrete cracking and reduces the structural capacity of the building as it ages. On top of this, incremental overloading of the building due to change of use on certain floors can have a detrimental effect on the building's integrity. Such incremental threats need to be identified and remedied. Section 85A of the Street, Drainage and Building Act 1974 provides for mandatory inspections of buildings more than five storeys every ten years. However, the Act requires the Local Authority to issue a notice to owners of these buildings and most of them hardly do so. Owners take advantage of this and consequently, very few building owners perform such a task as it is perceived as an additional financial burden. Should another building collapse due to same cause as mentioned above, fingers will again be pointing at stakeholders.

Recommendation

a) Governments, especially State Governments should issue instructions to all Local Authorities to ensure notices are sent to all building owners to observe this rule. Alternatively, Act 133 can be amended to make it mandatory for the owners of buildings to perform periodical inspection by PEs according to the guidelines drawn up by the Ministry of Housing and Local Government. (Guidelines on Periodical Inspection of Building issued by Ministry of Housing & Local Government 1996).

Demolition Stage

a) Demolition done by contractors without understanding the structural behaviour of a building's structure

This is a common practice where the demolition of structures, especially low rise, contractors and workers pay little attention to the safety aspects of workers and the public. Structural components are demolished based on operational convenience.

In the recent case of the collapse of some Ipoh shophouses during demolition killing two passers-by in 2009, the demolition sequence was wrongly performed. The contractor started demolishing the shophouses from the back leaving the front of the shops which faced the street unprotected. As demolition reached the front, the cantilever action of the cantilevered balconies of the buildings together with some stacked tiles suddenly tilted the shell of the buildings towards the street and it fell on three passing cars killing two people.

b) Demolition contractors submitting standard method statements without understanding the structural behaviour of structure

Contractors demolishing buildings have been using the same standard method statement to satisfy the Local Authority and DOSH as the rule requires them to submit such a document before commencing demolition work. Contractors may not follow what is stated in the method statement.

In 2009 alone, there were two building demolition sites where a sudden building collapse caused fatalities.

Recommendation

a) Method statement must be signed by a PE which is then submitted to DOSH and he must undertake the supervision of the demolition of critical parts of the structure.

Analysis of Stakeholders' Exposure to Causes of Building Failure and their Frequency

It would appear that contractors have the highest number of exposures to causes of building failure that occur along the supply chain with 16 (67%) followed by Engineers with 10 (42%) based on 24 identified possible causes. (Some causes may have more than one stakeholder). See Table 1 and Chart 1.

Frequency of stakeholders' exposure to stated causes of building failure

In terms of frequency of exposure to building failures, the number of such causes under the categories of high, medium and low is as follows:

High	: 6
Medium	: 38
Low	: 11

The majority of the identified causes of failure are in the medium range of frequency of possible occurrences comprising 69% of the total. Of these, contractors have the highest exposure rate (16), followed by engineers (10), developers (9), and supervisors (6). As such, more attention should be placed with these four categories of stakeholders to minimise building failure or mishaps on site. See Table 2 and Charts 2 and 3.

Legislation regulating the various phases along the construction supply chain in relation to causes of building failure

Generally, the regulating authorities have limited resources to inspect every detail and even if this is done, there is no guarantee that mishaps will not happen. The Local Authorities' technical personnel are generally not conversant with the requirements of design codes and work specifications. In fact, most of their professional staff are not registered with the regulatory boards. The primary function of regulatory staff is to ensure compliance with procedures and policies of the Government. In fact, the Governmental trend now is shifting towards self-regulation where a bigger burden will be imposed upon the professional consultant to

Stakeholder	No. of exposures	As % of total
Contractor (Cr)	16	67
Engineer (Ir)	10	42
Developer (Dv)	9	37
Supervisor (Ss)	6	25
Architect (Ar)	4	17
Local authority (La)	3	13
Pentadbir Tanah (PT)	3	13
Planner (PI)	2	8
Other agencies (Oa)	2	8

Table 1: Stakeholder' exposures to causes of building failure that occur along the supply chain

	Dv	Cr	Ar	Ir	Ss	PT	La	PI	Oa	Total	%
H	2	1	1	0	0	0	1	0	1	6	11
M	4	15	2	6	6	2	1	1	1	38	69
L	3	0	1	4	0	1	1	1	0	11	20
Total	9	16	4	10	6	3	3	2	2	55	

Table 2: Frequency of stakeholders' exposure to stated causes of building failure (H-high, M-medium, L -Low)

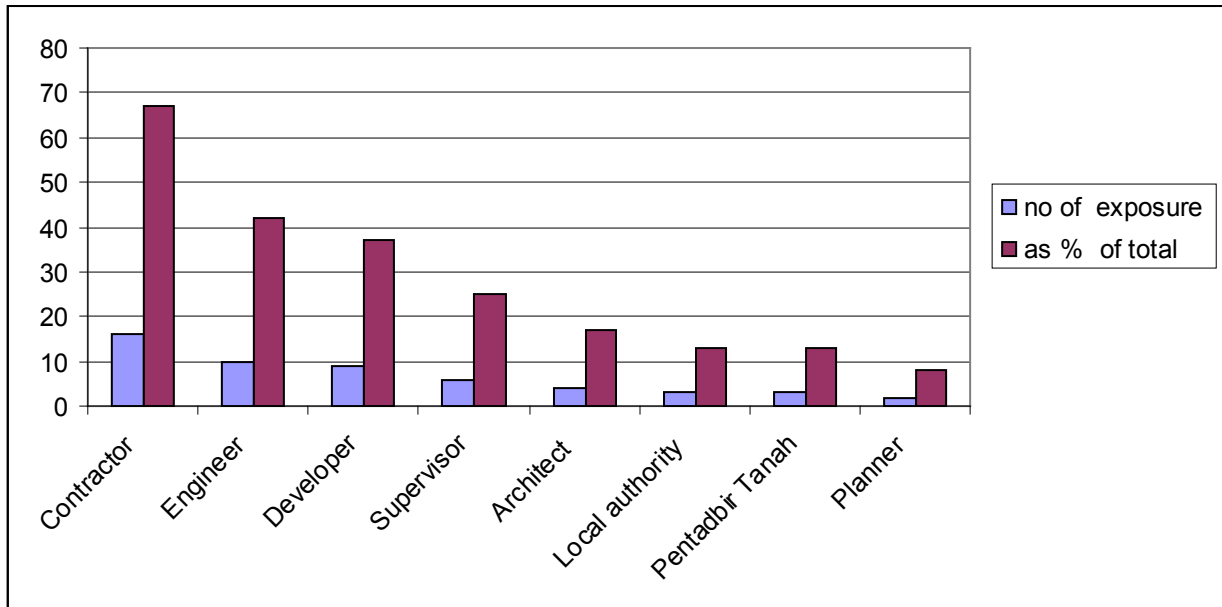


Chart 1: Stakeholders' exposure to causes of building failure by that occur along the supply chain (as % of total)

Total number of identified exposures that caused building failures: **24**

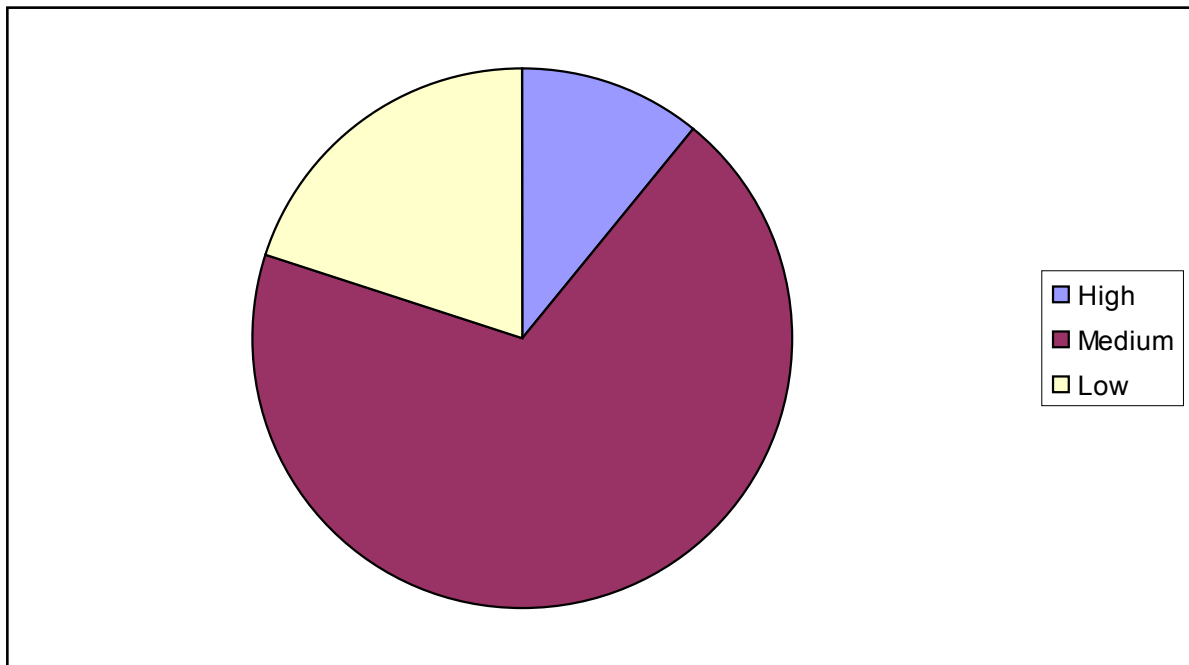


Chart 2: Frequency of stakeholders' exposure to stated causes of building failure

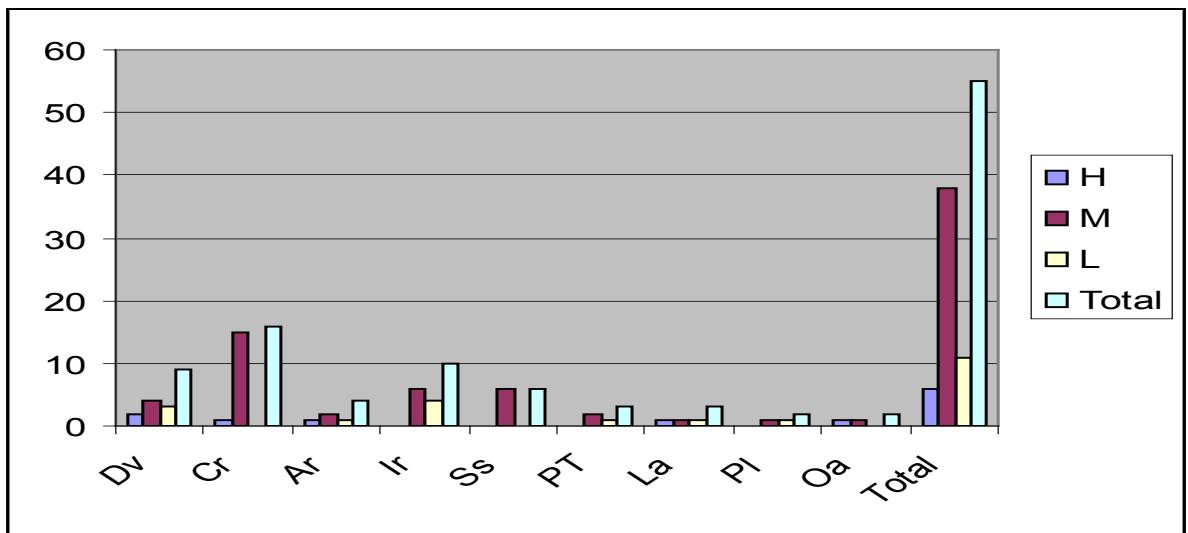
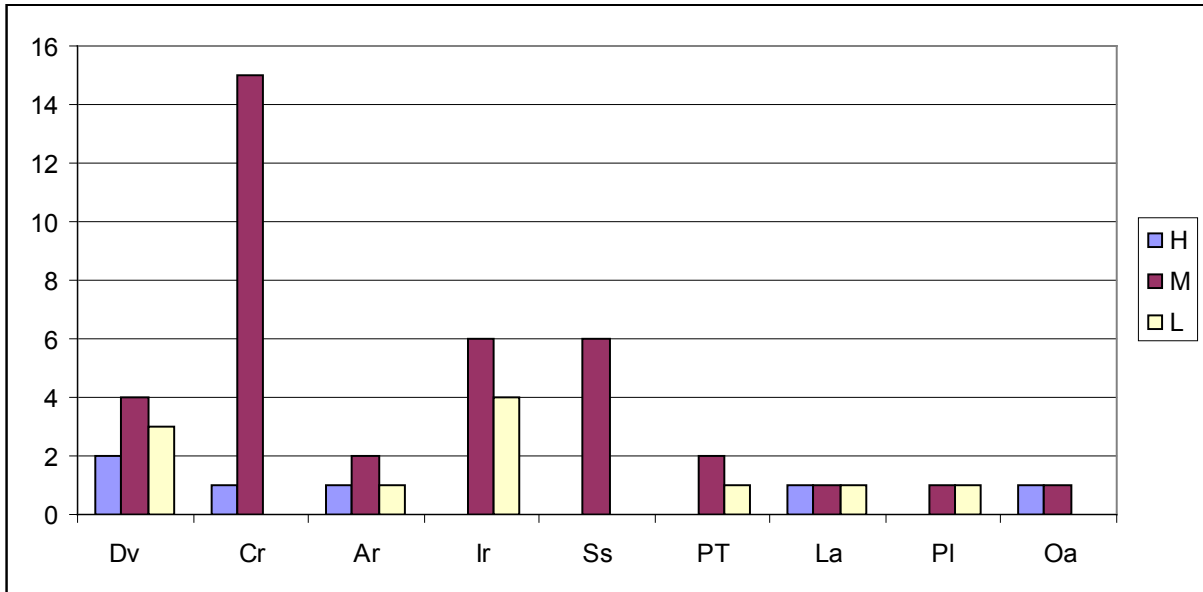


Chart 3: Frequency of stakeholders exposure to stated causes of building failure

	Item	Property Development Supply Chain
a	Land conversion	National Land Code, Act 56
b	Planning permission	Town and Country Planning Act, (Act 172)
c	Building plan approval	Street, Drainage and Building Act (Act 133), UBBL, Earthworks By-Laws, Electricity Supply Act, Water Service Act, Sewerage Service Act, Solid Waste Management & Public Cleansing Act, Telecommunication Act, Fire Service Act,
d	Procurement	Contract Act 1950
e	Construction	Act 133, UBBL, E/works bylaws, OSHA, CIDB
f	Building delivery	Act 133, UBBL
g	Extension & renovation works	Act 133, UBBL, Act 172, Fire Service Act
h	Periodical Inspection	Act 133, UBBL
i	Demolition	Act 133, OSHA

Table 3 - Legislations regulating the various phases along the property development supply chain

carry the accountability and responsibility since the Street, Drainage and Building Act as the main Act governing the construction works and the Interpretation Act, Act 388 provides indemnity to Government bodies and its officers against any liability thereof. See Table 3.

Responsibility and accountability of stakeholders

In view of the higher expectation of professionals on work quality and compliance, self-regulating mechanisms were introduced, such as the CCC, where architects and engineers have been given the authority to issue CCCs (which was formerly the sole authority of the Local Authority). So now all stakeholders, especially professionals must adhere to a level of professionalism to gain public confidence on the safety and health aspects of the construction industry.

There must be a consolidated effort among stakeholders to reduce the frequency of mishaps in the construction industry in order to restore the confidence of the public locally and abroad. The *Straits Times* editorial on the June 4, 2009 headlined “The Collapse of Professionalism”, calling professionals in the Building industry to step up and act on any failure in carrying out their duties with due care and diligence in accordance within the laws and ethics that govern their profession, is a wake-up call to stakeholders to take measures to improve the situation. With the liberalisation of service sectors within the ASEAN region particularly for professionals, there is a more urgent need to improve the professionalism of our local professionals if we are to face the competition from the regional players amongst the 580 million strong ASEAN communities. Meanwhile, it is also important to prevent sub-standard professionals from the ASEAN community practicing in Malaysia where public safety is of paramount concern.

A Strategic Plan to minimise/mitigate building failures

In view of the sizeable number of identified possible causes of building failures and mishaps in the construction industry based on statistical records, the WG has decided to focus on the causes with higher frequency and higher tendency as a priority area while the others are placed as longer term goals.

The strategic plan covers seven sections:

1. General awareness of construction/building safety
2. Strengthening role of regulating authorities especially Local Authorities
3. Ensuring quality and independence of Engineers
4. Upgrading competency of Site Supervisors/Inspector of Works
5. Review the Code of Ethics for professionals
6. Clearer delineation of responsibility to produce certain 'structural' drawings by architects and engineers
7. Enhance the accountability of contractors

General awareness of construction/building safety

Since many of the causes of construction failures can be traced back to non-professional stakeholders such as owners, developers, land officers, planners, occupiers and even financiers, it is therefore important that these non-professional stakeholders are fully aware of the prevailing regulations in place and understand the risks associated with construction works. With this in place, land officers will be careful when approving land conversion for sites with adverse geotechnical conditions, ex-dump sites or sensitive ground. Private projects will have to seek professional input before putting up structures even if they are minor in nature such as small bridges, etc. Extension works to existing buildings especially houses should seek engineer's input.

The WG recommends the following general awareness action plan:

- a. *Publicity through circulation of pamphlets on the risk of building failures;*

- b. *Make publicity easily available to professional associations, CSR (Corporate Social Responsibility) service counters as practised in Hong Kong, to provide technical advice.*

Strengthening the role of regulating authorities especially Local Authorities

Since several projects' failures are traced to incompetency of engineers as Submitting Persons due to insufficient experience in a specific field, local Government should insist on checking by an accredited checker as provided for in the Street, Drainage and Building Act, Act 133 for certain categories of buildings based on the height, complexity and geotechnical setting. Act 133 should be amended to strengthen this requirement as the current provision is only limited to projects during the course of construction and much discretion is left to the Local Authority. Meanwhile, the Local Authority's engineers should be trained and updated with the latest technology since they are the ones receiving and endorsing the consulting engineers design drawings.

WG recommends the following:

- a) *To amend the Street, Drainage and Building Act, Act 133 and UBBL to make it mandatory for the developer/owner to appoint an accredited checker for the categories of property development based on the size and complexity of the project.*
- b) *Local authority engineers to undergo mandatory training courses every two years to update them on new technological practices and codes of practice in structural and geotechnical works.*

Ensuring quality and independence of Engineers

Of the 18,054 PEs registered by BEM as of December 31, 2017, 10,425 were registered as PEPC (Professional Engineer with a Practising Certificate) involved in Engineering Consultancy Practices (ECP) while the rest

were involved in various capacities related to engineering practices. A total of 3,602 ECPs were registered to provide engineering services to clients. The current system of becoming a consultant engineer with a minimum of four years of experience after graduation should be reviewed. Many new consultants lack sufficient experience and knowledge of the regulations in force on safety aspects of construction.

WG recommends the following:

- a. *All potential candidates sitting for a professional examination must be pre-qualified on prevailing regulations related to safety of building such as UBBL, Act 133, OSHA, etc.*
- b. *Remind all PEs to practice only in the field of engineering that they are competent and possessing the relevant experience. This also applies for PEs seeking procurement of engineering consultancy services.*
- c. *All payment of professional fees to be paid directly to the Professional Boards as stakeholder similar to the practice by the Board of Surveyors for cadastral surveys to enhance professional independence of PEs with their client.*

Upgrading competency of supervisors

Site Supervisors or Inspector of Works as the persons directly supervising construction works full time should be more accountable apart from just registering them. The level of expertise should be specified according to the size and complexity of the project.

WG recommends the following:

- a) *To specify that all local 'Standard Forms of Contract' specify the number and level of qualification of the supervisors needed to act for the consultants.*
- b) *To amend UBBL on all Form Gs except G1 to require the relevant supervisor to sign the*

relevant Form Gs that he has supervised the project and that he takes responsibility for the portion of works he is connected with.

Review Code of Ethics of Professionals

Professionals should act in the public interest and not be in collusion with developer for individual interests at the expense of the public. Developers as the paymaster do sometimes exert influence over the professionals to act unprofessionally as has happened in some housing projects such as over-certification for progress payments or certifying beyond their authority.

WG recommends the following:

- a) *All payments to professionals to be paid directly to the Professional Boards as stakeholder similar to the practice by the Board of Surveyors for cadastral survey.*
- b) *BEM to review their procedure of Disciplinary Action against defaulting engineers including guidelines and regulations in a more effective manner.*

Clearer delineation of responsibility of certain 'structural' drawings by architects and engineers

The joint circular between BEM and BAM on the rights to submit Building Plans should be reviewed as "Appendix C" (common list jointly issued by LJM and LAM) contain few structures with structural elements. "Structural element" is well defined in the Street, Drainage and Building Act i.e. "structural elements means those parts or elements of a building which resist forces and moments and includes foundations, beams, columns, shear cores, slabs, roof trusses, staircases, load bearing walls and all other elements designed to resist forces and moments but excludes doors, windows and non-load bearing walls". There was a case where both the architect and engineer denied responsibility when timber



Construction site of a new property development

roof trusses failed in a shophouse project in Kulim.

WG recommends the following:

- a) *A declaration from both the Boards that any drawing submitted to the Local Authority with structural element would be the responsibility of any of the Submitting Person concerned unless the note of 'to engineering details' is stated by the architect.*

- b) *The two Boards review the three appendixes (Joint BEM/LAM Memorandum List) on the authority to submit building plans.*

Action Plan

Taking cognisance of the various prevailing policies, legislation, guidelines and individual

agency's action plans, the above recommendations would require consensus and engagement from all stakeholders to ensure success in the implementation stage. Feedback from the construction industry practising at the ground level is equally important to gauge the effectiveness of the proposed recommendations.

Conclusion

The local construction industry fraternity is recovering from bad publicity due to the recent spate of building failures that are of equal concern to the public and Government. There is therefore an urgent call to beef up the professional standing of our stakeholders in order to regain the confidence of the public and potential customers.

In the light of the liberalisation of engineering services, it is even more urgent to improve the professional standing of local stakeholders responsible for the safety of local property development. ■