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Household Shelters – Rationale and Public Concerns

By

Maj Chan Keen Mun
Head Shelter Branch
Fire Safety & Shelter Bureau

HOUSEHOLD SHELTERS – RATIONALE AND PUBLIC CONCERNS

OVERVIEW OF SHELTER PROGRAMME

The Civil Defence Shelter Programme is part of the government's plan to build up our Civil Defence preparedness under the umbrella of Total Defence. The long-term goal of the shelter programme is for every resident in Singapore to be protected by a purpose-built shelter berth.

2 Civil Defence shelters began in Aug 1983 for Singapore when the government decided to harden 9 underground MRT stations as shelters. In Oct 86, the plan to embark on a shelter construction programme was announced, starting with the building of shelters at the foot of new HDB blocks from 1987.

3 Shelter construction was, in Mar 89, extended to suitable facilities in other types of public developments such as new secondary schools, community centres and government buildings. As in any other programme, there is a need to periodically review its criteria and effectiveness, and to seek improvements. In the same light, a review of the effectiveness of the shelter programme and the basic shelter design and planning parameters was carried out in 1992-1993.

4 Arising from the review, it was decided in 1994 that shelters for new dwelling units should be located inside the units or on the same floor. Following this decision, the building of public shelters at the foot of HDB blocks was discontinued and instead the building of shelters in the form of household shelters inside new HDB flats was started from Apr 95 onwards.

5 In Oct 97, the Civil Defence Shelter Act 1997 was enacted requiring the compulsory provision of household shelters or storey shelters in new houses and flats. A six-month grace period to allow owners, developers and QPs sufficient time to incorporate shelter requirements in their development plans was given before the requirements of the Shelter Act came into operation with effect from 1 May 98.

WHY WE NEED SHELTERS?

6 The shelter programme represents one of the cornerstones of Singapore's Civil Defence Programme. Against the backdrop of World War II when civil defence preparations in Singapore were grossly inadequate, the shelter programme plays a crucial

role in the Total Defence of Singapore, to ensure her continued safety and security and to avoid the dire straits she was in in December 1941, when preparations came "too little too late".

7 In many countries with established civil defence programmes, a comprehensive shelter construction programme is recognised as the most visible and effective way to protect civilians from weapon effects during a war emergency. Furthermore, in a war emergency, NSmen at the battlefront would have greater peace of mind, knowing that their loved ones at home would be protected. They could then channel all their energies to the task at hand.

BRINGING SHELTERS CLOSER TO THE PEOPLE

8 When the shelter programme was first started, the sheltering concept was based on the public having sufficient warning time before an attack to seek refuge in public shelters. Such shelters were then being built at the foot of new HDB flats, schools, community clubs and other public buildings. However, from lessons learnt in recent conflicts, a credible shelter programme should cater for a wide range of threats including scenarios of very short warning time and chemical attacks.

9 The rationale for building household shelters within new flats is to provide occupants with quick access to protection. By locating the shelters within the flat, residents will be able to seek immediate cover. Casualties may be higher when residents have to make their way to a shelter at the foot of the building. This is because it will take a much longer time for the residents (and thereby increasing their exposure to weapon effects) before they reach the safety of the communal shelter.

10 There are also practical advantages of household shelters over public shelters built at the basement or void deck of the apartment block. First, life during a war emergency can be as close to normalcy. Another consideration in favour of household shelters over public shelters is the comparative ease of finding suitable peacetime uses for and maintaining them. It is also economical because the void deck space can be freed for other recreational and social uses.

ADDRESSING PUBLIC CONCERNS

Protection Capability of Household Shelters

11 Due to the relatively new concept of household shelters and the conventional thinking that basement shelters provide better protection (which is why people feel instinctively that one should seek protection at the foot of a building), the general public has expressed their concerns on the usefulness and capability of household shelters to withstand effects of artillery shellings and bomb attacks. Furthermore, people are under the impression that when the building is directly hit by bombs, the building structures would collapse like a pack of cards leaving the household shelter towers standing on their own.

12 Household shelters are reinforced structures that are designed to protect occupants from missile, aerial and artillery bombardment. These shelters can also protect residents against chemical attacks for a few hours. The protection to the occupants comes from a combination of thickened structures and the shielding offered by the surrounding walls, floor and ceiling slabs. Additionally, the household shelters are stacked in vertical columns and offer additional stiffness, and enhance the resilience of buildings against blast effects or unforeseen loadings and forces.

13 As for the building itself, if it were to be hit by bombs, there will inevitably be localised destruction of the building structure around the point of explosion. However, from studies of the effect of weapons on buildings, damage is usually localised at the point of impact Several floors of the building may be perforated, but the building as a whole, may remain standing. Whilst a shelter can give protection in many situations, it is not practical to design a shelter that will give total protection. For example, if a large enough bomb were to explode sufficiently close to any shelter, then that shelter may be damaged with resultant casualties amongst the occupants. This is an inevitable risk in a war situation.

14 The general public had also questioned the peacetime use of household shelters as store rooms, and how they could then be used for emergency purposes when the need arises. During peacetime, it is expected that residents would use the shelter as a storeroom. When threats become more imminent, the residents will be alerted to prepare their household shelters for emergency use. For example, they have to remove the things stored inside the household shelters; seal up the ventilation openings; bring in essential

items such as TV and telephone sets, battery-operated torchlights, important documents, etc.

Design Efficiencies of Household Shelters

15 Another public concern is the requirements pertaining to the location and design of household shelters which are perceived to be restrictive and therefore resulting in design inefficiencies.

16 Being a protected structure, there are inevitably some architectural, structural and other requirements to be imposed on the household shelter that are different from those of other 'peacetime use' spaces. These requirements (eg setback distances, size, thickness of walls) are to provide optimum protection to the occupants against weapon effects including chemical attacks.

17 Without compromising safety requirements and the underlying rationale of having household shelters (HS), the SCDF has, since 1998, constantly reviewed its shelter specifications to make it easier for the building industry to comply. The main revisions to the 'Technical Requirements for Household Shelters 1997' have been promulgated via circulars, and incorporated in the new 'Technical Requirements for Household Shelters 2001' (published in Feb 2002). These revisions include:

a. Reduction in HS sizes and setback distances of HS walls.
b. Exclusion of sky-rise gardening balconies from GFA of flats for purpose of determining minimum HS sizes.
c. Introduction of requirements for HS in basement and beneath internal staircase.
d. Introduction of Product Listing Scheme for HS doors.

18 The review and updating of the shelter specifications is an on-going process. Since Feb 2002, the following have been/ are being considered:

a. Allowing common HS wall for abutting HSs in landed housing developments.
b. Allowing the building external wall to be the HS wall (ie. with no setback distance), contingent on additional requirements being met.
c. Allowing HS tower walls to sit on transfer decks instead of continuing down to the foundations, contingent on additional requirements being met.

19 The SCDF has been regularly conducting forums and discussions with building industry practitioners to keep them abreast of the latest developments, as well as soliciting feedback and tapping ideas on how to further refine our shelter requirements.

Rescue of Trapped Shelterees

20 Another issue that has often been raised is on the survivability of occupants trapped in household shelters in a damaged building.

21 The risk of being trapped inside household shelters and remaining unnoticed is minimised because of certain design considerations. For instance, the ceiling outside the door is strengthened to prevent debris from blocking the door. Telephone connections are provided for shelterees to call out if the lines are not damaged. In the event that the HS door is jammed for any reason during a war, the SCDF is equipped to effect a rescue of those trapped inside. The SCDF has several types of aerial rescue appliances and equipment to deal with different rescue situations, including rescue from heights.

CONCLUSION

22 An effective shelter programme will provide the physical protection and psychological assurance required for the survival of the population in a war emergency. Household shelters are the most effective form of sheltering protection as household shelters are "scenario-free" – ie. not bound by limitations of warning times – as occupants can have quick access to protection.

23 SCDF has taken taken steps to address the public concerns on household shelters. SCDF will continue with publicity and education efforts to improve the public's acceptability of household shelters.

Updates on Household Shelter Plan Submission, Commissioning and Technical Requirements

By

Mr. Ong Teck Soon
Unit Head, Civil Defence Shelter Engineering Department
Building and Construction Authority.

UPDATES ON HOUSEHOLD SHELTER PLAN SUBMISSION, COMMISSIONING, AND TECHNICAL REQUIREMENTS

BY
ONG TECK SOON
CD SHELTER ENGINEERING DEPT

Topics covered:

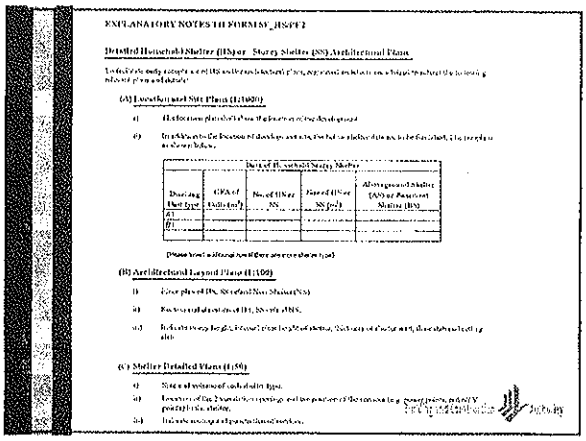
- **Submission**
  - Common Non-Compliances in Architectural Submissions
  - Explanatory Notes to Submission Form
- **Technical Requirements**
  - Relaxation of internal common wall for abutting HS in landed dwelling units
  - Maximum size of HS
  - Applicability of basement shelter technical requirements
  - Structural continuity of HS tower
- **HS commissioning**
  - First Shelter Requirement
  - Commissioning Requirements
  - Common problems

Common non-compliances in HS architectural submission

- Setback distance
- HS wall, slab, door
- Missing details such as sections through HS door opening, HS next to staircase , HS towers showing HS/NS

Explanatory notes to HS submission form

- Attached to HS Architectural Submission Form SF_HS/PF2
- Downloaded from BCA website
- Facilitate early approval of HS architectural plans
- Provide salient information in shelter plan



EXPLANATORY NOTES TO FORM SF_HS/PF2

Detailed Household Shelter (HS) or Storey Shelter (SS) Architectural Plans

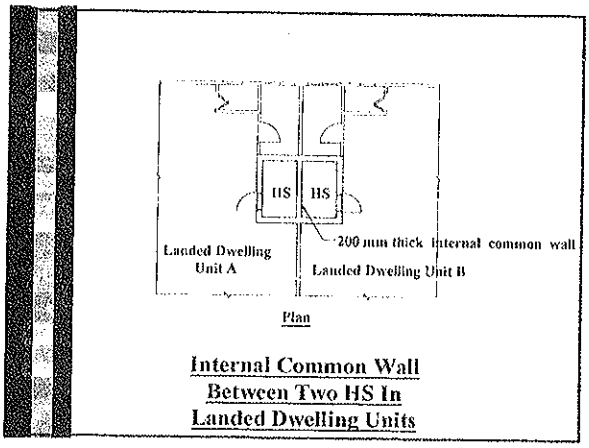
(A) Layout and Site Plans (1:1000)

(B) Architectural Layout Plans (1:100)

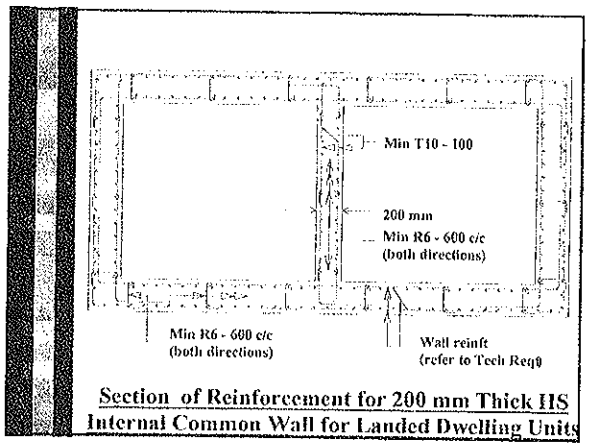
(C) Shelter Detailed Views (1:50)

Relaxation of internal common wall for abutting HS

- **Current Requirement**
  - For landed dwelling units, a pair of adjacent HS cannot share an internal common wall. There shall be a separation between these two HS walls.
- **Revision**
  - --There is no need for a separation between HS walls of adjoining landed dwelling units. Reinforcement detailing similar to non-landed dwelling units.



Internal Common Wall Between Two HS In Landed Dwelling Units



Section of Reinforcement for 200 mm Thick HS Internal Common Wall for Landed Dwelling Units

Maximum size of HS

- **Current Requirement**
  - maximum HS size allowed is 4.8m²
- **Exceptions**
  - HS size exceeds 4.8m² allowed on the following conditions:
    - @HS wall thickness to adopt that of SS for the given storey height
    - @Same HS door width and ventilation openings
    - @No requirement for rescue hatch and catladder

Applicability of Basement Shelter Technical Requirements

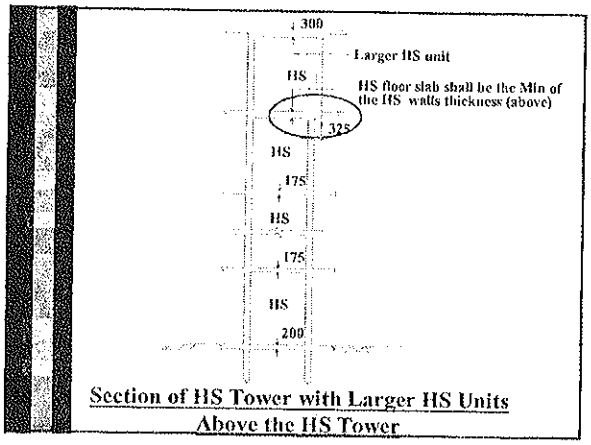
- **Current Requirement**
  - basement shelter requirements are only applicable to HS located in the basement storey as defined by URA
- **Exceptions**

Applicability of Basement Shelter Technical Requirements

- **Current Requirement**
  - Basement shelters shall be located within the footprint of the habitable space of the first storey of a dwelling unit
- **Exceptions**

Structural continuity of HS tower

- **Current Requirement**
  - The wall thickness of any HS or NS within the HS tower shall not be less than that of the HS or NS above
- **Exceptions**



Section of HS Tower with Larger HS Units Above the HS Tower

First Shelter Requirement

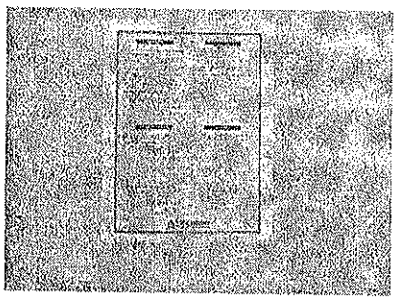
- **Current Practice**
  - Since April 2002, the commissioning of first shelter for projects with more than 3 HS is optional. However, QPs are advised to conduct first shelter commissioning as a reference for other HS in the project

Commissioning Requirements

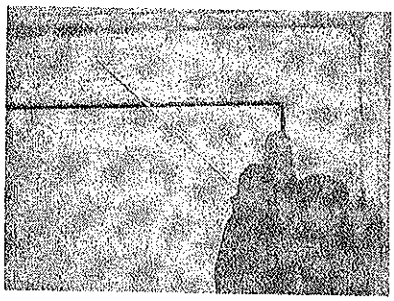
- General Inspection
- Chalkmark Test
- Light Penetration Test
- Airtightness Test

GENERAL INSPECTION OF HS

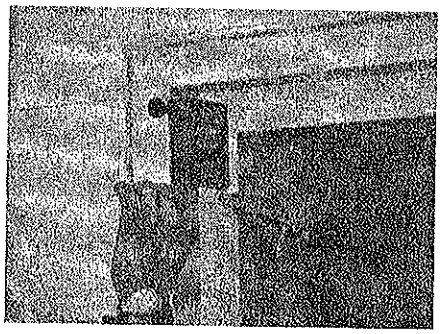
HS Door Notice Sticker



Planarity of HS door and frame



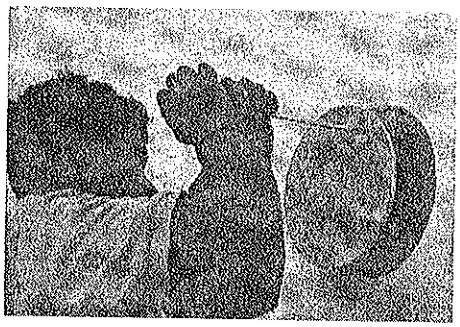
Verticality of door frame



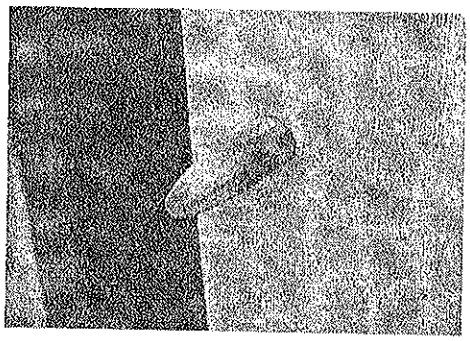
Planarity of HS door leaf



Functionality of ventilation plates

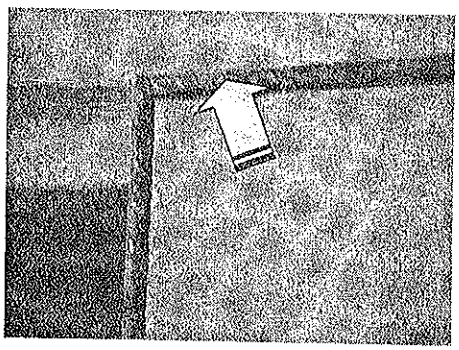


Functionality of HS door



CHALK MARK TEST

Chalk Mark Test



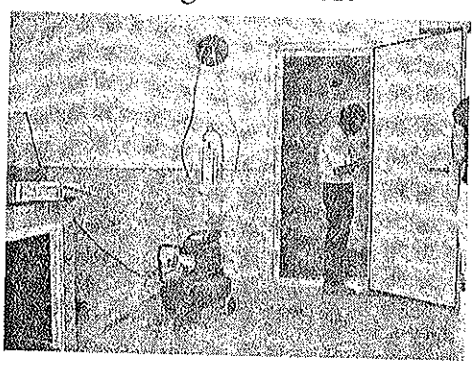
LIGHT PENETRATION TEST

LIGHT PENETRATION TEST

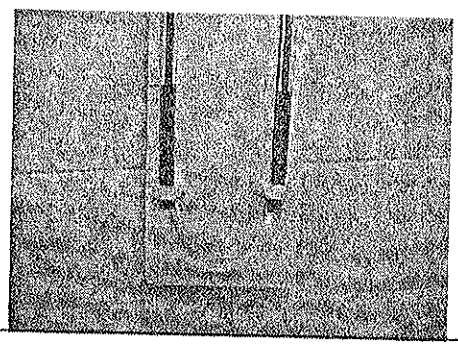
- **Consists of the following :-**
  - HS Door engaged in emergency mode
  - If light is visible from inside of HS, the test is deemed failed

AIR TIGHTNESS TEST

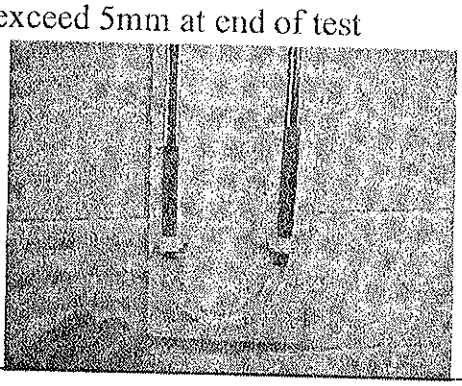
Air Tightness Test



No air pressure difference between interior and exterior of HS initially



Air pressure difference must not exceed 5mm at end of test



Commissioning Procedure

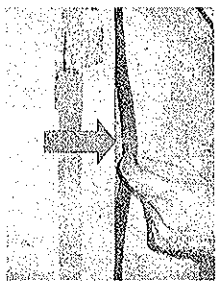
- **Consists of the following :-**
  - General Inspection of HS
  - Chalkmark Test
  - Light Penetration Test
  - Airtightness Test
- The 3 tests mentioned above can easily be conducted and they do not require any specialist knowledge

Common problems in HS commissioning

- **Door frame not aligned**
- **Difficulty in opening and closing HS Door**
- **Hollowness in HS door frame**
- **HS Door Notice Sticker not provided**

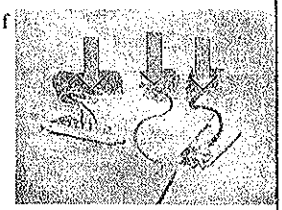
Common problems in HS commissioning

- **Inadequate bonding of door seal to seal holder**



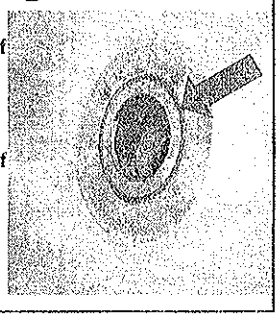
Common problems in HS commissioning

- **Inadequate bonding of door seal to seal holder**
- **Services conduit not sealed at both ends**



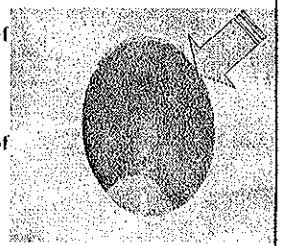
Common problems in HS commissioning

- **Inadequate bonding of door seal to seal holder**
- **Services conduit not sealed at both ends**
- **Inadequate bonding of 'O'-rings to grooves of ventilation sleeves**



Common problems in HS commissioning

- **Inadequate bonding of door seal to seal holder**
- **Services conduit not sealed at both ends**
- **Inadequate bonding of 'O'-rings to grooves of ventilation sleeves**
- **Plastering on internal HS walls**



4 years into self-regulation system - The journey towards greater empowerment

By

ESO Heng Chai Liang
Dy Head, Plans Approval & Consultation Branch
Fire Safety & Shelter Bureau

FOUR YEARS INTO THE SELF-REGULATION SYSTEM - THE JOURNEY TOWARDS GREATER EMPOWERMENT

Introduction

The SCDF, together with the building industry, has embarked on this journey into self-regulation since Sept 1998. It was an inevitable step considering SCDF's strategic goal in working in partnership with the industry. The SCDF recognised the need for gradual self-regulation and thus took a number of years to plan and prepare the industry towards this move. At the same time, as the industry is also gaining maturity in its professional expertise in fire safety designs, the move towards self-regulation was timely. The self-regulation system was implemented in phases, first in the form of the self-declaration system in 1996, followed by the self-regulation system in 1998. In fact, as Singapore progresses into the new millennium, one of the key government initiatives is to deregulate the industries. We can now see that more government agencies are gearing the building industry towards this direction.

For the building industry and the SCDF, it is time to take stock of how the self-regulation has fared after 4 years since its introduction. This paper gives an update on the processes involved in the self-regulation system. These processes are:

- Plans Submission and Approval
- Plans Audit
- Consultation
- Waiver
- Inspection of completed fire safety works

In these updates, the trends and typical problems encountered in these processes will be highlighted.

Plans submission and approval

Graph 1 in **Annex A** shows an upward trend in the number of plans submitted for approval from 1994 to 2001. In 2001, 8600 plans were submitted compared to 6000 plans in 1994, representing a 40% increase. This is not unexpected. As the country progresses, we can expect more new buildings to be built and increased retrofitting or upgrading

works to be carried out to older buildings. This is clearly evident in our country's changing landscape over the years.

With this increase in plans submission, how have we coped under the self-regulation system? We have done reasonably well, considering that over 90% of the plans have been approved within 2 working days as reflected in graph 1. In 1999, this figure was 97.7% followed by 97% in 2000 and 86.2% in 2001. The lower figure reflected in 2001 was a result of some teething problems, which arose from the change in our on-line plans registration and processing system, from HOLMS (Home Affairs On-Line Management system) to FISOPS (Fire Safety On-Line Processing system).

The fast plans approval means on-site construction works can commence much sooner compared to in the past. Works need not be unnecessarily delayed. This augurs well for the Singapore industry as the fast plans approval makes Singapore more viable and versatile for foreign investments and conducive for fast track projects.

Plans Audit

With this speedier plans approval, the next question you may ask is "Are these approved plans in compliance with fire safety requirements?"

Graph 2 in Annex B shows the number of plans audited from 1999 to 2001. These plans audited constitute about 10% of the total plans submission. An average of about 1000 plans a year for the past 3 years from 1999 to 2001 were randomly selected for audit. Of these audited cases, about 7% or 73 cases out of the 1000 cases did not comply with the requirements. Fortunately, not all of these non-compliant cases were deemed to be serious and could be easily rectified. Only in a handful of cases, 35 cases or 3 % of the total audited cases, were the QPs in charge issued with a warning letter or fine. This relatively small number shows that QPs do take fire safety requirements seriously and the quality of plans has improved quite significantly compared to in the past. In the past, prior to the self-regulation system, at least 50% of the plans submitted did not comply with the requirements and were issued with Written Directions to be amended.

What are the common problems encountered during the audit process? Firstly there is still a small group of QPs who are not well versed with the fire code. This is reflected in the non-compliant plans submitted. We would like to urge this minority

group to come forward for consultation with our officers. The QPs can either write in to us or walk in for consultation anytime during office hours. The SCDF also conducts annual fire safety courses for QPs. In addition, the SCDF holds quarterly dialogue sessions with the building industry and 2 fire safety seminars a year. These are aimed at updating the QPs on the latest developments or changes made to the fire safety requirements.

Secondly, we are aware that the QP in charge frequently delegates to the technical draftsman to prepare plans. While this may be a common practice in the industry, it is essential that the QP check the plans for compliance before submitting to the SCDF for approval. There were instances where our officers detected glaring errors in the plans such as not indicating the hardstanding location or inadequate provision of exit staircase. With closer supervision and checking, such errors can be avoided.

Thirdly, there are some QPs who have doubts on the interpretation of certain provisions in the fire code but proceed to submit plans before seeking consultation to clarify their doubts. Such cases usually result in non-compliant plans being submitted. Therefore we urge QPs to seek clarification with us first if there are any doubts on the requirements, say pertaining to interpretation of certain clauses in the Code, before proceeding to submit the plans. This will save the QP time and trouble in having to explain the non-compliance to the Audit Check Committee, and to submit an amendment plan to rectify the non-compliance later on.

Fourthly, there were instances where QPs have been penalized because knowingly or unknowingly, they submit plans that do not comply with fire safety requirements. When they are asked to explain the deviations, they often cite that they will follow up with waiver applications. This is a wrong procedure. Approval for any deviations from fire safety requirements must first be sought through the waiver process before the plans are submitted. Once the plans are submitted for approval, it must be in compliance with the requirements and should there be deviations, the QP is responsible.

Another typical situation, which the QP must avoid is succumbing to the pressures of the owners in submitting non-compliant plans. This is quite an often-cited reason given by the QPs when they are asked to explain the deviations. Such a reason

cannot be acceptable. The onus is on the QP as a professional to explain the fire safety requirements to the owners or think of alternative ways to accommodate their requests. If the deviations cannot be overcome, then as a last resort, the QP can seek for a waiver through the Waiver Committee. By submitting non-compliant plans because of mounting pressures from the owner would undermine the QP's professional integrity in the exercise of his duties.

Consultation

A bar chart of the consultation trend is shown in graph 4 in **Annex C**. It can be observed that since the self-regulation system was introduced in Sept 98, there was a surge in the number of consultations from 2900 in 1998 to about 5100 in 2001, an increase of about 76%. It is an indication that QPs are making a conscious effort to ensure that plans submitted comply with the fire safety requirements. On the SCDF's part, the consultation sessions with the QPs enable us to better understand the problems faced by the industry and these will be taken into consideration when the Fire Code Review Committee reviews the fire safety provisions. These sessions serve as an avenue for us to obtain feedback from the industry. And from time to time, if need be, SCDF would issue circulars to clarify issues, to make changes to certain fire safety requirements or to improve the clarity of clauses in the Code. This is evident in the many circulars that the Force has issued prior to the introduction of the latest Fire Code.

What are the common problems encountered during our consultation sessions with QPs ? Firstly we do receive requests from QPs or their draftsmen to check their plans for compliance. Such requests are made as some QPs/draftsmen may not be familiar with the fire code or still have the mindset that it is the responsibility of the Force to check their plans for compliance. Being a professional and as the project QP, the QP would be most familiar with the project. On SCDF's part, it can assist by giving advice or comment on specific fire safety issues or to clarify the requirements.

Secondly we also receive requests from QPs or their draftsmen to offer alternative solutions to their fire safety designs. However much we would like to assist the QPs, we are not in the position to do so. What we can do however is to give our comments or advice on the solution proposed by the QP.

Thirdly, we also encounter QPs seeking waiver of fire safety requirements from our officers or enquiring about the likelihood of their waiver application being granted by the Waiver Committee. The QPs who make such requests may not be familiar with the waiver mechanism. The proper channel of seeking waiver of fire safety requirements is through the Waiver Committee. Our officers are not empowered under the Fire Safety Act to grant waivers. Similarly, our officers are not in the position to advise on the likelihood of waiver approval. Waiver applications are granted on a case by case basis. As such, a waiver that has been granted for a particular project may not be similarly granted for another project.

Waiver

Graph 3 in **Annex D** shows that waiver applications have also been on the rise from 1998 to 2001. In 2001, there was a 45% jump in the number of waiver applications from 2200 in 1998 to 3200 in 2001.

Since the implementation of the self-regulation system, QPs are more conscious of the need for fire safety compliance on their designs. It is important that QPs make a conscious effort to submit compliant plans as plans are now approved on the basis of QP's declaration of compliance. If non-compliance were detected at the construction stage, it would be more costly to rectify.

It is also observed that the rate of successful waiver applications is increasing compared to unsuccessful ones over the years from about 60% in 1998 to 75% in 2001. This shows that QPs are making less frivolous waiver applications but genuinely have problems complying with the requirements. The waiver applications are also very closely monitored by the Force as they indicate the relevancy of the Fire Code and enable revisions to be made.

A common problem encountered during waiver processing is the insufficient information provided by QPs making the waiver application. For example, an application to use certain materials, if not accompanied by any detailed specifications of such materials, would make it difficult for the Waiver Committee to make its assessment. Under such circumstances, the committee would usually request for more information from the applicant before making decision. And this therefore results in unnecessary

delay.

Another common observation is that in seeking waiver for a particular requirement, the applicant does not give an explanation of the constraints he faced. Neither is there any alternative solution proposed to compensate for the shortfall. For the Waiver Committee to appreciate the problems faced by the applicant and subsequently make a decision, it is important that the applicant give reasons why a certain fire safety requirement cannot be complied with and provide alternative solutions so as not to compromise fire safety standards. The lack of such information and alternative proposal in some waiver applications makes it difficult for the Waiver Committee to consider the waiver favourably.

Inspection

Graph 4 in Annex E shows the number of Temporary Fire Permit / Fire Safety Certificate applications from 1998 to 2001 and the number of inspections conducted by our officers, about 10% of the applications. The average number of applications over the past 4 years is 4100. Of these, 470 applications were randomly selected for inspection.

Most of the projects comply with the requirements. In most instances where non-compliance is detected, these are easily rectified and are not deemed to be serious. Non-compliance, which has been deemed to be serious constituted about 1% of the inspected cases or 5 cases a year. Examples of which include open-flame cooking without compartmentation or fire suppression system, non-provision of hosereel and no fire protection provided for raised floor exceeding 150mm. For cases where issuance of TFP/FSC is withheld due to a major non-compliance, the owners may be severely affected, as they could not open the premises in time for their business.

QPs should take note of two issues. Firstly, there are instances where QPs apply for TFP/FSC even while knowing that there are deviations from fire safety requirements to be rectified on site. They overcome this by submitting as-built drawings together with their TFP/FSC application. This arrangement is not acceptable, as SCDF does not consider as-built drawings to be a formal document. Therefore, all deviations from fire safety requirements are to be rectified and reflected in the amendment plan submitted to SCDF for approval before an applying for TFP/FSC.

The other area pertains to application of TFP/FSC prior to obtaining waiver for any deviations from fire safety requirements. When non-compliance are highlighted to the QPs during site inspection by our officers, QPs usually explain that they will follow up or are in the process of following up with waiver application. Similar to the problem highlighted earlier pertaining to submission of plans prior to obtaining waiver for any deviations from fire safety requirements, it must be noted that likewise, approval for any deviations must first be granted by the Waiver Committee before application of TFP/FSC.

Benefits

The benefits of the self-regulation system to the industry cannot be overstated. The system has significantly reduced waiting time for the building approvals, bringing about faster implementation of building projects. Developers can now proceed to construct their buildings as plans are approved almost immediately upon submission. This helps to facilitate earlier completion of buildings for sale or lease.

The scheme also benefits QPs, as up-front consultation is practiced and likely mistakes are avoided before plan submission. In this new system, the Force will be able to provide more personalized consultation services to the QPs. Such a consultative approach better enables QPs to ascertain the best innovative way to meet fire safety requirements and become increasingly more familiar with the Fire Code as they take greater responsibility for their work.

The scheme also benefits the SCDF. Previously, our officers were pre-occupied with checking plans and issuing written directions to the QPs, resulting in many correspondences between the two sides. This was clearly inefficient and a lot of precious time and resources were wasted. But with the self-regulation system, its regulatory role has turned to a closer partnership with QPs and long submission queues are eradicated, thus allowing plan-approving officers to be engaged in higher value-added work in the development of fire safety standards in Singapore.

When the self-regulation system was first implemented, there was much concern over the enhanced role that QPs would be undertaking. There were many questions raised about the system itself, since the Bureau is no longer checking the plans before approving

them. QPs were worried that with the enhanced powers for SCDF to take remedial action, the system may be too harsh and QPs will be penalized even over small contraventions of fire safety requirements.

From the statistics gathered, we are pleased to say that the system has overall functioned well and served its intention. Along the way, we have encountered the issues raised above and have fine-tuned the system, taking into consideration the feedback and comments that you have given us. In the last 4 years that the system was in place, over 90% of the plans were approved within 2 working days. Only a small percentage of plans audited, about 3% were deemed to have non-compliance serious enough to warrant a warning letter or fine to be issued to the QP. It shows SCDF has not been high-handed in its dealings or over enthusiastic in handing out fines and warning letters.

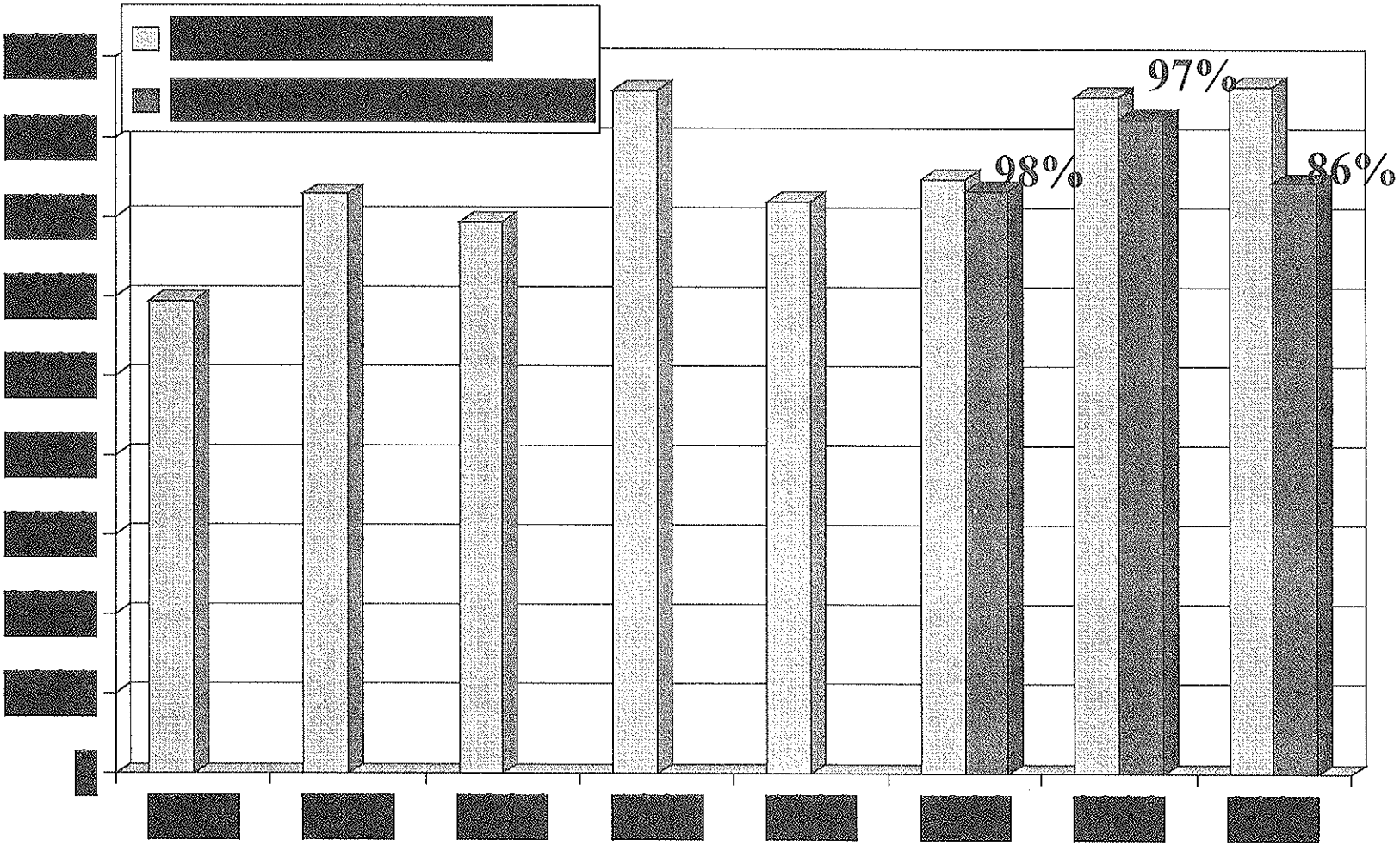
The most significant benefit resulting from the system is that it may be said that we have worked well together to meet the new challenge, from one of close and meticulous checking to one that encourages professional trust. QPs also actively seek consultation with the SCDF to ensure that their plans are correct to avoid costly rectification works later. This is clearly reflected in the increased number of consultations our officers have attended to. This change in mindset has brought about greater awareness of fire safety and closer partnership between the industry and SCDF in maintaining a high level of fire safety standard. However, it is of course hoped that by raising the problems mentioned earlier, which the SCDF would regard as teething problems, the next 4 years into the self-regulation system would see smoother plans approval and a higher standard of fire safety designs.

Conclusion

In conclusion, the self-regulation system has no doubt brought about a radical change in the administrative process of plans approval. More importantly, it marks the beginning of greater recognition of industry responsibility and competence and a change in the regulatory philosophy for SCDF, from paternalism to supervision. The system has fostered greater interaction between QPs and the SCDF. We are confident that the system will continue to function efficiently, and serve its twin objectives of fast plans approval while not compromising fire safety standards in Singapore.

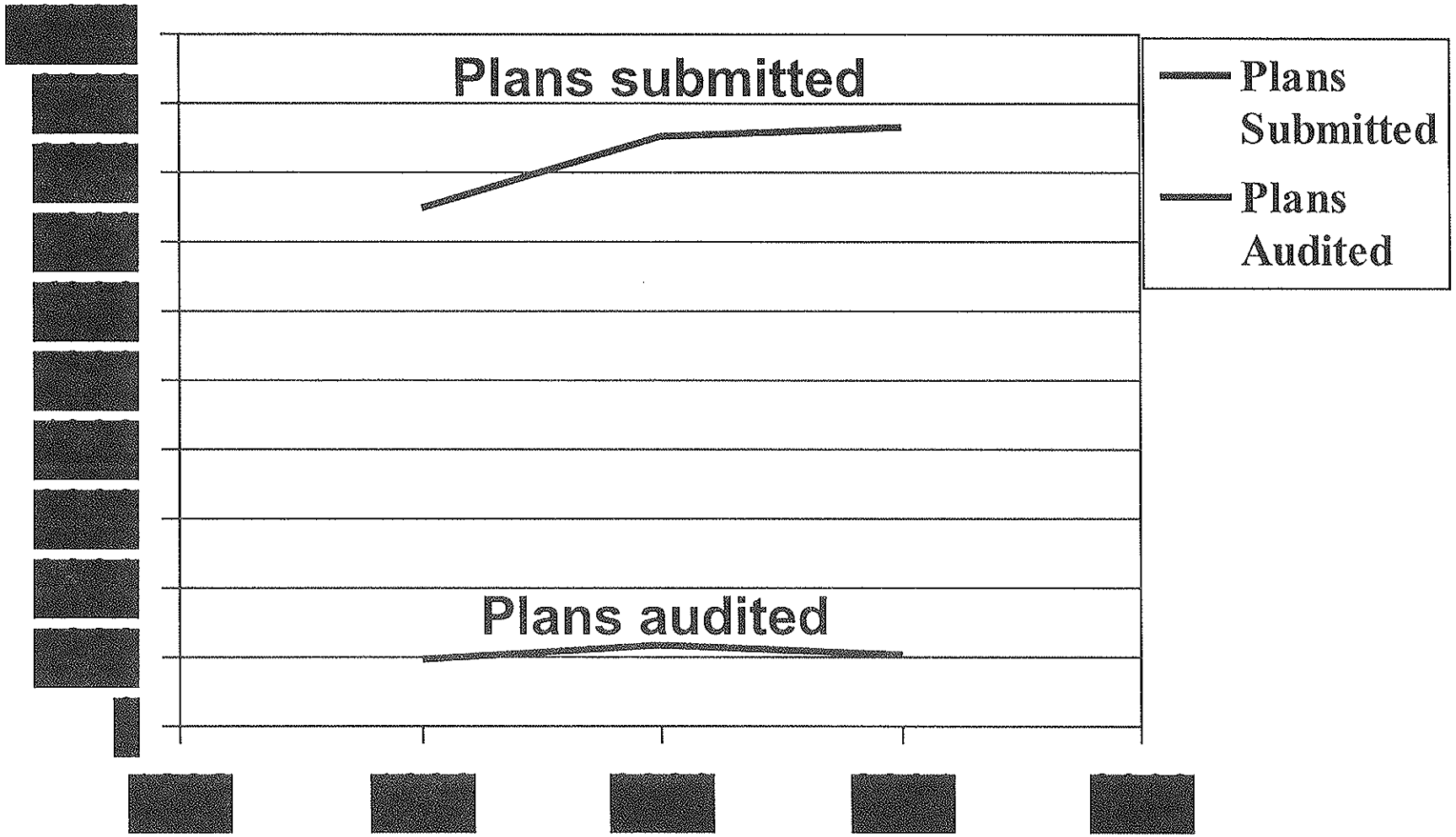
Annex A

PLANS SUBMISSION & APPROVAL



Annex B1

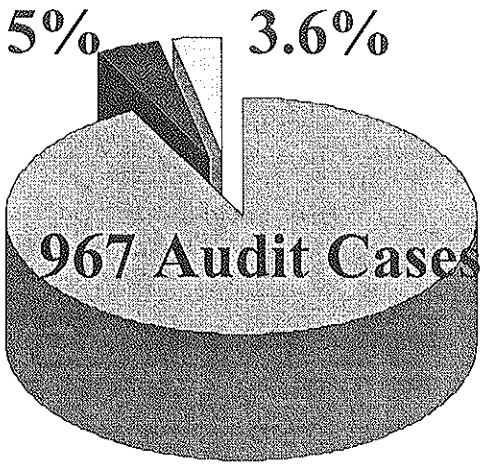
PLANS AUDIT



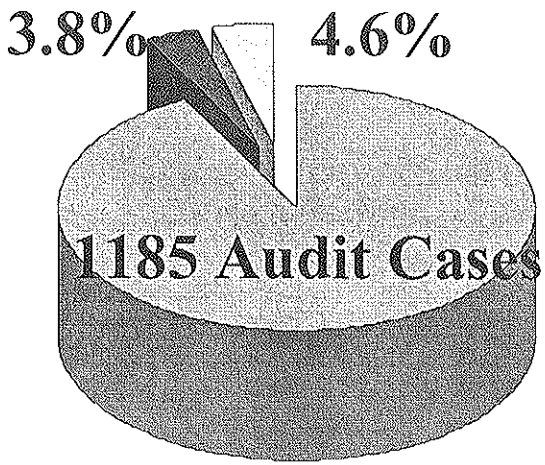
Annex B2

PLANS AUDIT

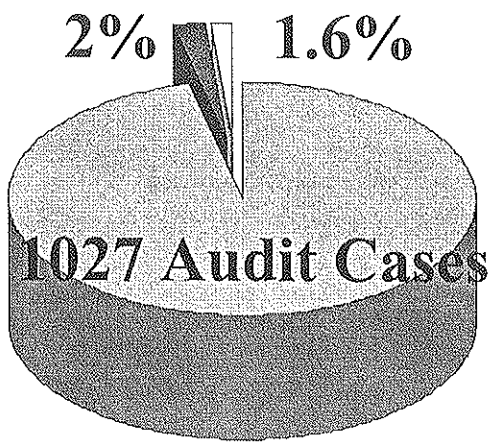
- **Audit Cases**
- **Not in order**
- Issued with fine/warning letter



1999

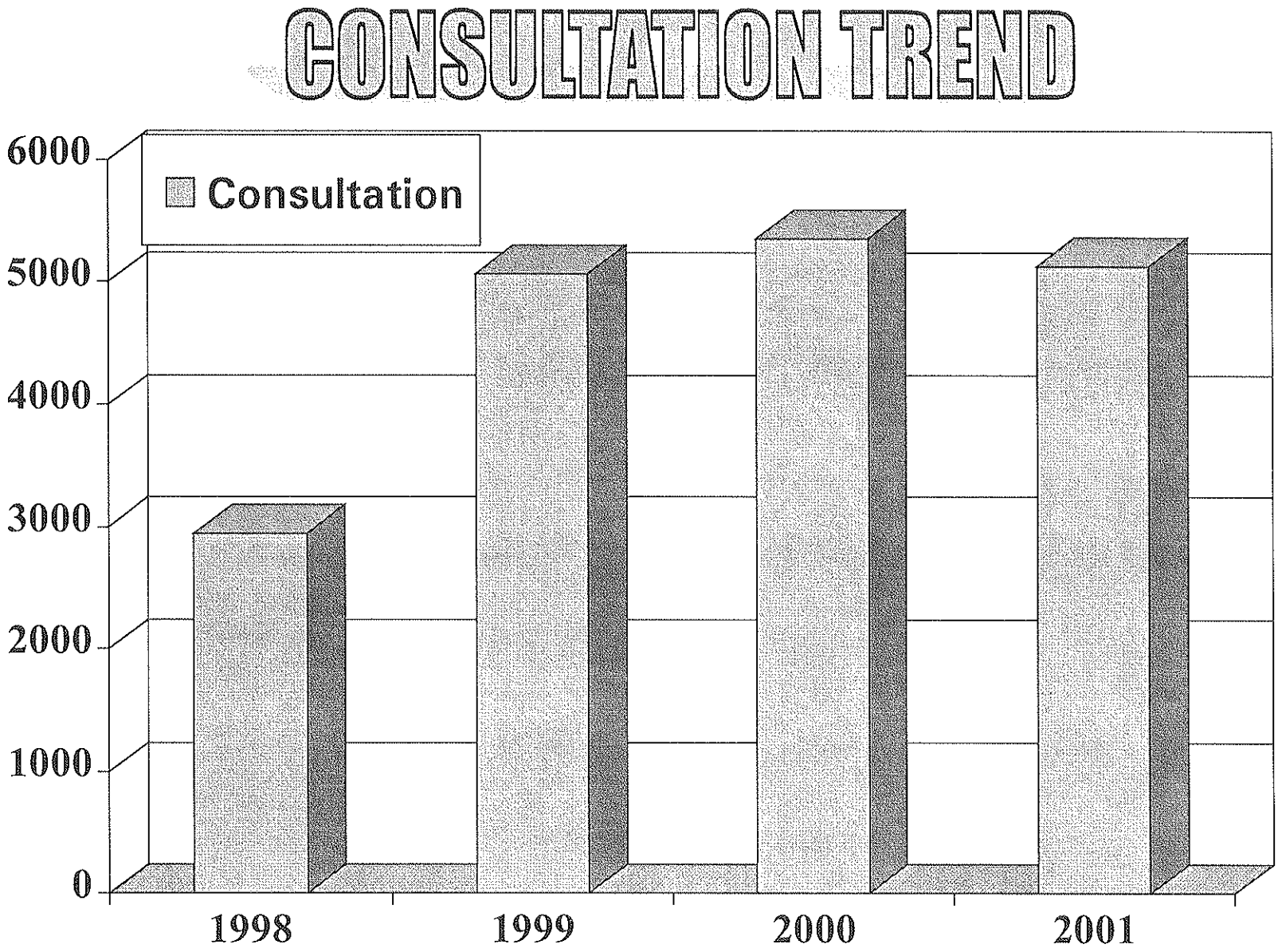


2000



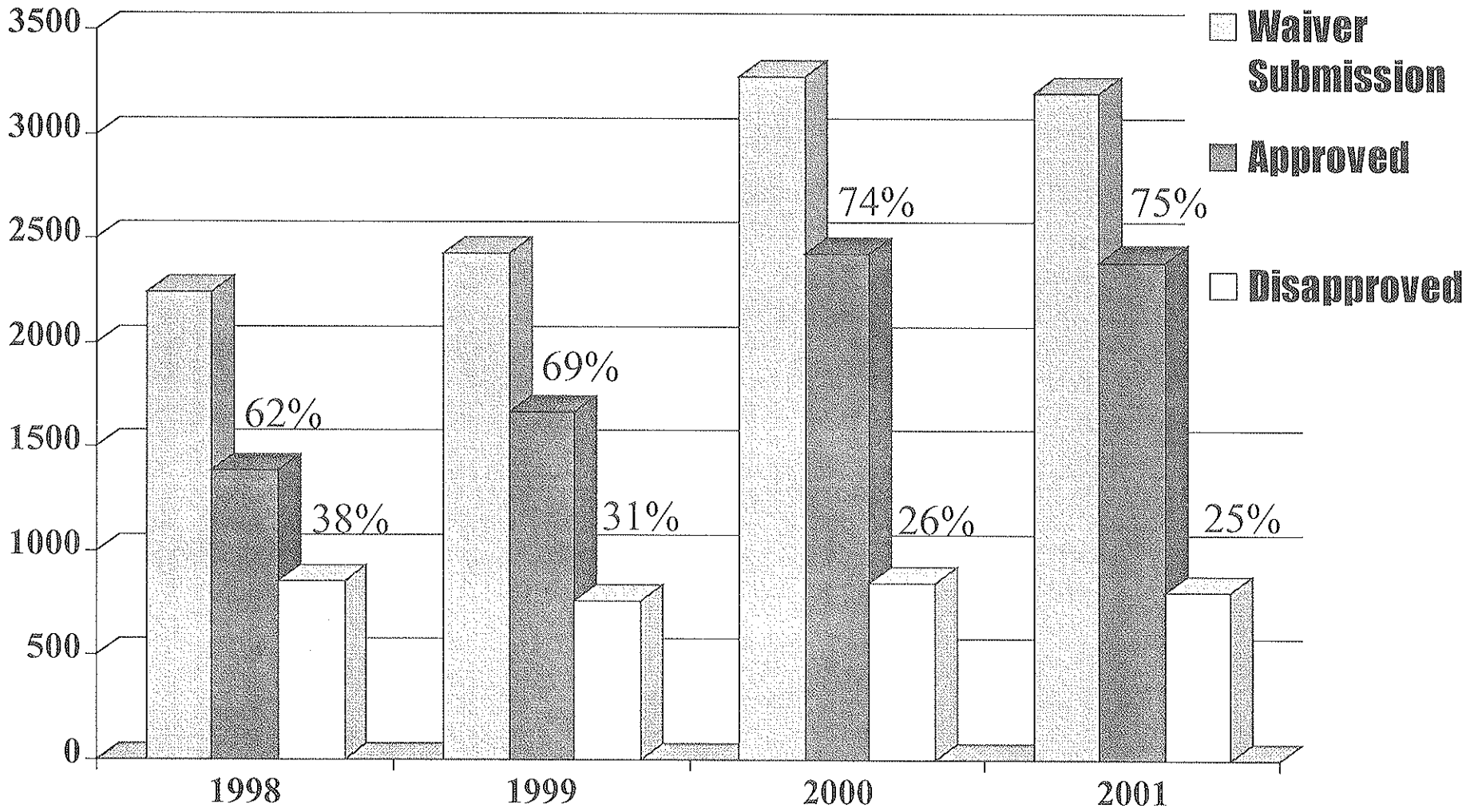
2001

Annex C


CONSULTATION TREND
Consultation
6000
5000
4000
3000
2000
1000
0
1998
1999
2000
2001

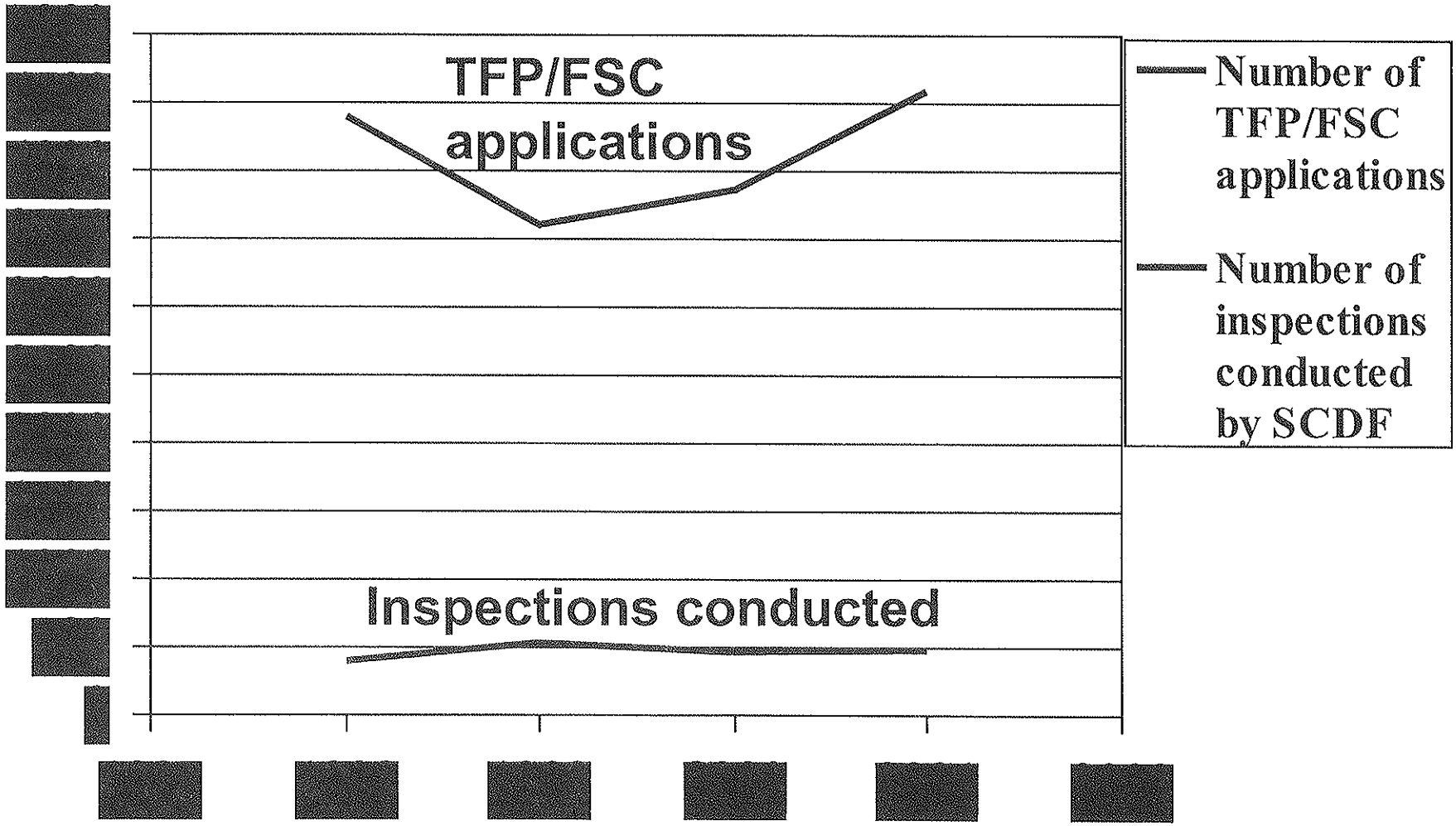
Annex D

WAIVER TREND



Annex E1

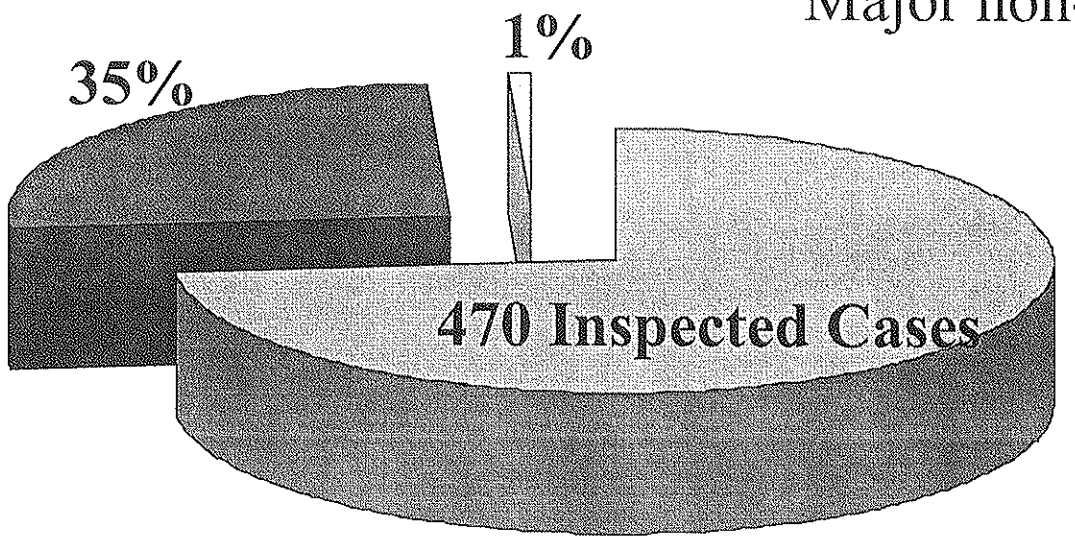
INSPECTION



Annex E2

INSPECTION

- **Inspected cases by SCDF**
- **Minor non-compliance**
- Major non-compliance



Average over 4 years
(1998 - 2001)

CORENET e-Submission System

By

Ms Genevieve Tan
Technical Consultant
IT Development Department
Building & Construction Authority

CORENET e-Submission

Presented By:

Genevieve Tan
Technical Consultant
Building and Construction Authority

Agenda

- Aim Of Presentation
- Introduction To CORENET (COnstruction and Real Estate NETwork)
- The CORENET e-Submission System (eSS)
- Common Concerns From The Industry
- Electronic Submission For Professional Application (ESPro)
  - Offline Application for eSS
- Summary of eSS

Aim of Presentation

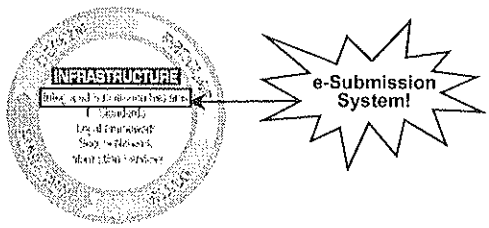
- To have a general understanding of CORENET e-Submission System (eSS) and its application tools.
- Available Training and Assistance Schemes

Introduction to CORENET

CORENET (COnstruction and Real Estate NETwork):

- Major IT initiative for Construction Industry
- A collaboration between the public and private organizations
- OBJECTIVE is to re-engineer the business processes of the construction industry

Introduction to CORENET



e-Submission System is one of the key infrastructure systems under the CORENET programme, aimed to create IT enhanced collaborative design environment.

INTRODUCING:

THE CORENET e-SUBMISSION SYSTEM (eSS)

The CORENET e-Submission System

Multimedia Show On Overview Of CORENET e-Submission System

The CORENET e-Submission System

What is eSS?

- Government to Business (G2B) internet-based portal
- Specially designed for industry professionals
- Submit project related plans and documents to regulatory authorities



The CORENET e-Submission System

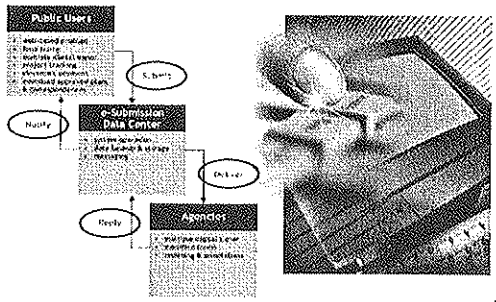


Key Features

- Multiple digital signatures on plans and documents
- Auto-populate common data on submission forms
- Central repository of approved plans
- Tracking of submission status online

The CORENET e-Submission System

Workflow of ESS



Electronic Submission System

The CORENET e-Submission System

Participants

Participating Regulatory Authorities :

- Building and Construction Authority
- Central Building Plan Unit
- Energy Market Authority
- Fire Safety And Shelter Bureau
- Housing & Development Board
- Infocomm Development Authority
- JTC Corporation
- Land Transport Authority
- Maritime and Port Authority
- National Parks Board
- Public Utility Board Water
- Power Gas Ltd
- Urban Redevelopment Authority

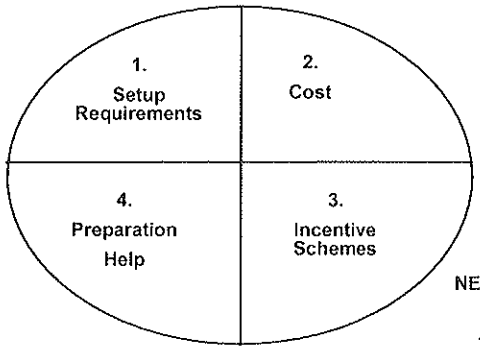
Representatives :

- Singapore Institute of Architects
- The Institution of Engineers
- Association of Consulting Engineers
- Real Estate Developer's Association
- The Singapore Contractor Association

Electronic Submission System

COMMON CONCERNS FROM THE INDUSTRY

Common Concerns From the Industry



Common Concerns From the Industry

1. What are the SETUP REQUIREMENTS FOR eSS

Common Concerns From the Industry

Setup Requirements (Hardware)

- Pentium PC with 400 Mhz and above
- Minimum 64 MB RAM
- Broadband connection (recommended)
- Minimum 1GB hard disk capacity
- Netrust Smartcard Certificate version 3 and Smartcard Reader

Common Concerns From the Industry

Setup Requirements (Software)

- Windows 98 and above
- Microsoft Internet Explorer ver5.x browser and above
- ESPro application
- InternetForms Viewer v4.4
- Digital Signer application (Optional)
- EDAForm application (offline module)
- JRE 1.3 (comes with the EDAForm application installation program)

FREE!

Back



Common Concerns From the Industry

2. How much will it cost me to have eSS?



Common Concerns From The Industry

Items	Set up	Recurring
1. Registration with licensed Certification Authority (e.g. Netrust)* • Applicant will be issued with an identity card	$85	$50/yr
2. Smart Card reader	$55	$0
3. High-speed Internet connection**	$150	$100/mth
4. Form filling tools***	$200	$30/yr

More

More

* early adopters will receive the certification authority registration license free of charge

** figure varies between ISP providers. The estimated are for low usage of 2GB per month schemes

*** early adopters will receive the form tools free of charge

Back



Common Concerns From The Industry

Application for the Netrust Card Certificate

- Call Netrust to schedule for an appointment.
- Turn up personally at Netrust office for a face-to-face verification.
  - ✓ Personal identification document (NRIC/Passport) for verifying identity and a photocopy of it.
  - ✓ Original or certified true copy of practising certificate from PEB or BOA and RCB certificate.
- Complete Netrust Digital Certificate Application Form.

Common Concerns From The Industry

Application for the Netrust Card Certificate

- Applicant will be issued with an Netrust card.
- Contact Netrust Pte Ltd for further information at www.netrust.net

Netrust Address:

10 Collyer Quay, #09-05/06

Ocean Building

Operating hours: 9am to 5:30pm (Mon to Fri)

Common Concerns From The Industry

Application for the Netrust Card Certificate

Free Netrust licenses for First year

for first 300 early adopters ofeSS.

So far 250(?) have been taken up,

There are only 50 left

Common Concerns From The Industry

Netrust Card

For more information, please contact:

Genevieve Tan (Ms)

Tel: 6325 5906

E-Mail: genevieve_tan@bca.gov.sg

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Common Concerns From The Industry

Application for the Internet Forms Viewer

- To request for a new license, firm to write in to BCA System Administrator with:
  - ✓ Company's name
  - ✓ Company's address
  - ✓ Contact person
  - ✓ Designation in the firm
  - ✓ Professional registration number, if any
  - ✓ Reference number of project registered with the System
- Other requirements to check with the System Administrator.

Common Concerns From The Industry

Application for the Internet Forms Viewer

For more information, please contact:

Cheng Tai Fatt (Mr)

Project Manager

Tel: 6325 8661

E-Mail: cheng_tai_fatt@bca.gov.sg

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Common Concerns From the Industry

3. Are there any incentive schemes?

Common Concerns From the Industry

INTECH

- Training grant of 70% of the course fee under the Initiatives in New Technologies (INTECH).
- Offered by EDB and administered by BCA.
- The scheme is applicable to:
  - ✓ Singaporeans or Singapore PR
  - ✓ Not applicable for ministries and statutory boards.
- More details available at CORENET web site, under IT Training and Promotion.

Common Concerns From The Industry

Jumpstart Construction

- Subsidises industry SMEs' cost for e-Submission System set-up and development of other e-business capabilities.
- Funding up to 50% of e-commerce development cost or S$20,000, whichever is lower.
- Grant offered by SPRING and administered by BCA.
- Claim requires evidence of >= 3 online transactions.
- Supported components are consultancy, hardware, proprietary software and subscriptions.
- Refer to www.corenet.gov.sg for more information.

Common Concerns From The Industry

Jumpstart Construction

For more information, please contact:

Maria Low (Ms)
Jumpstart Construction Administrator
Tel: 6325 5017
E-Mail: maria_low@bca.gov.sg

Back

Common Concerns From the Industry

4. Are there any preparation help available for users?

Common Concerns From the Industry

Training Classes

- Course content includes hands-on training on:
  - ✓ Registering as CORENET ESS user
  - ✓ Download software from ESS
  - ✓ Using ESPro
  - ✓ Using Online CORENET ESS functions
- Details are posted on <http://www.corenet.gov.sg>
- Over 700 Professionals have been trained!!!

Common Concerns From the Industry

Site Support

Priority is given to:

- Companies doing their 1st Submissions.
- Trained eSS companies

For more information, please contact:

1.	Doris Lim (Ms)	6325 5902	Doris_lim@bca.gov.sg
2.	Genevieve Tan (Ms)	6325 5906	Genevieve_tan@bca.gov.sg

Back

BENEFITS OF eSS

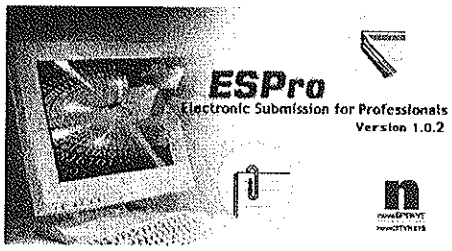
The CORENET e-Submission System

Benefits of eSS



SUBMISSION MADE EASY!!!!		
1. Submit Electronically	2. Submit Anytime	3. Submit Anywhere
ELIMINATES.....		
4. Multiple Trips to Agencies	5. Repeated Data Entry	6. Production of Hardcopies

Electronic Submission For Professional Application (ESPro)



Electronic Submission For Professional Application (ESPro)

What is ESPro Application?

- Offline application tool
- To manage and prepare the document offline for submission to the regulatory authorities via the CORENET e-Submission System.

Electronic Submission For Professional Application (ESPro)

Steps To Submission and Demonstration

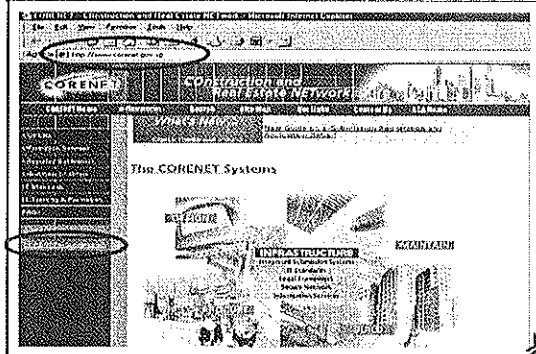
Electronic Submission For Professional Application (ESPro) – M & E Engineers

1. Registration of User
   - Obtain User ID
2. Download ESPro Application
   - Offline application tool

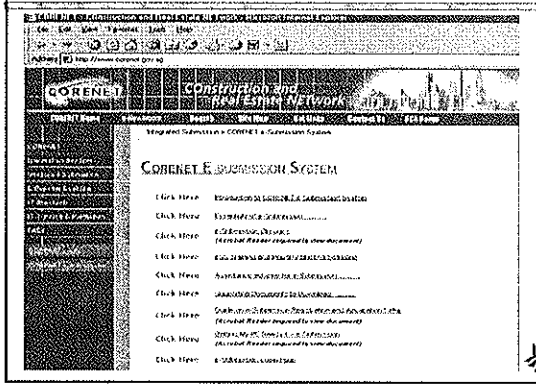
3. Add Project
4. Selection of Forms to Download
5. Completion of Forms
5. Add External Files (eg. Drawings)
6. Digitally Sign Documents
7. Select Appropriate Recipients
8. Submissions to CORENET server
9. Tracking of submissions online

Workflow of Using eSS

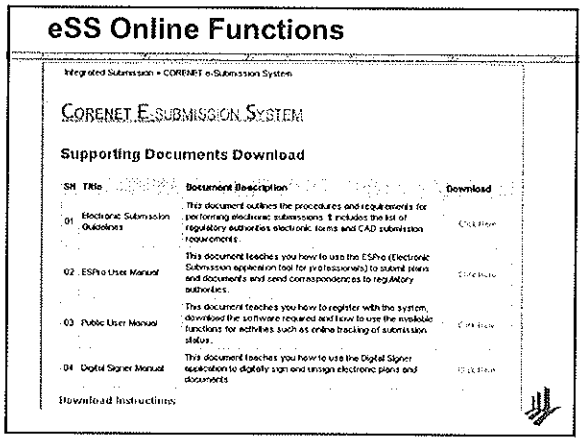
eSS Online Functions



eSS Online Functions



eSS Online Functions



Integrated Submission » CORENET e-Submission System

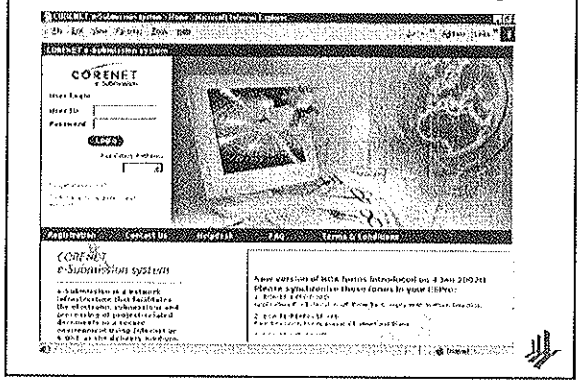
CORENET E-SUBMISSION SYSTEM

Supporting Documents Download

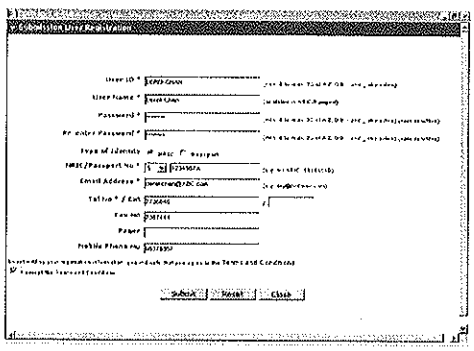
SN	Title	Document Description	Download
01	Electronic Submission Guidelines	This document outlines the procedures and requirements for performing electronic submissions. It includes the list of regulatory authorities electronic forms and CAD submission requirements.	Click Here
02	ESPro User Manual	This document teaches you how to use the ESPro (Electronic Submission application tool for professionals) to submit plans and documents and send correspondences to regulatory authorities.	Click Here
03	Public User Manual	This document teaches you how to register with the system, download the software required and how to use the available functions for activities such as online tracking of submission status.	Click Here
04	Digital Signer Manual	This document teaches you how to use the Digital Signer application to digitally sign and unsign electronic plans and documents	Click Here

Download Instructions

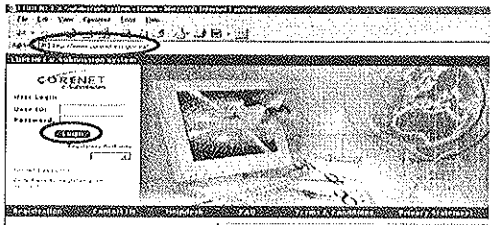
http://www.corenet-ess.gov.sg



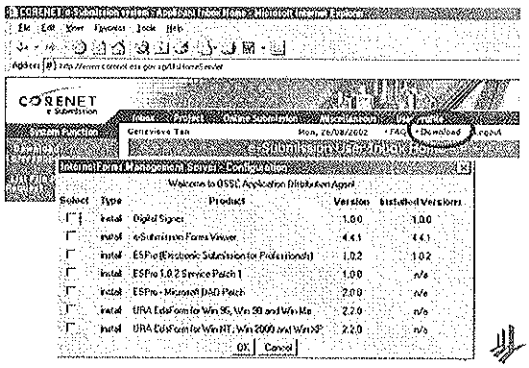
E-Submission User Registration



eSS Online Functions



Downloading of ESPro Components



Electronic Submission For Professional Application (ESPro)

Online Functions Demonstration

SUMMARY



Summary

- CORENET e-Submission System
  - ✓ Key Features
  - ✓ Workflow
  - ✓ Benefits
- System Requirements for eSS
  - ✓ Hardware
  - ✓ Software
- Assistance Schemes Available
  - ✓ Jumpstart Construction
  - ✓ INTECH

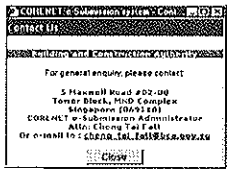


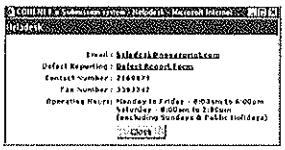
Summary (Cont'd)

- Electronic Submission for Professional Application (ESPro)
  - ✓ Outline of ESPro Application for Submission
- Online Functions of eSS
  - ✓ Downloading of Correspondences
  - ✓ Tracking / Modifying of Project status
  - ✓ Updating of user account



Need to Know More Information?







Thank You!



CORENET e-information System

By

Ms Connie Look
Senior Technical Officer
IT Development Department
Building & Construction Authority

CORENET
e-Information

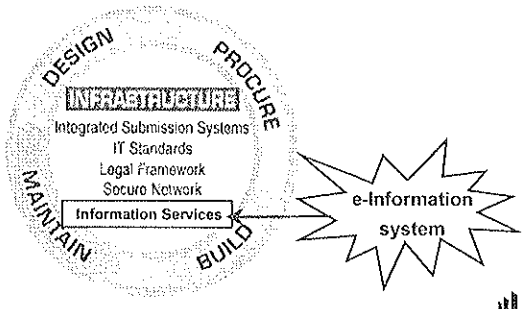
Presented By:

Connie Look
Senior Technical Officer
Building and Construction Authority

Agenda

- Introduction to e-Information System
- Who is Involved
- Why e-Information System
- Situation Without e-Info
- Current Situation with e-Info
- On-Line Key Functions
- On-Line Supporting Functions
- 'Live' Demonstration

Introduction to e-Information System



Introduction to e-Information System

- A central repository
  - for building and construction related information
  - accessible anywhere, anytime via Internet
- Forms the sub-module
  - to provide foundation support for Integrated Plan Checking Systems
- Reduces the need for
  - hard copy storage space and
  - in-house contents management system



Introduction to e-Information System

- Information contents
  - are structured and harmonised using XML.
- Information available:
  - regulations, codes and standards, product catalogue, contractors listings and performances such as CONQUAS scores, awards, ISO certification, etc.



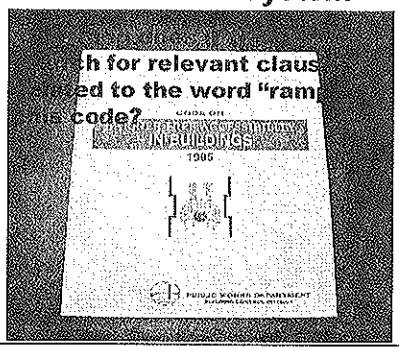
Who is Involved?

- Support and contribution from 13 regulatory departments spreading across 7 Ministries:
- AGC,
- BCA, HDB, NParks, URA,
- IDA, LTA,
- MOM, JTC,
- CBPU, PUB,
- FSSB,
- Singapore Powers: PowerGrid Ltd, Power Supply Ltd and City Gas Pte Ltd

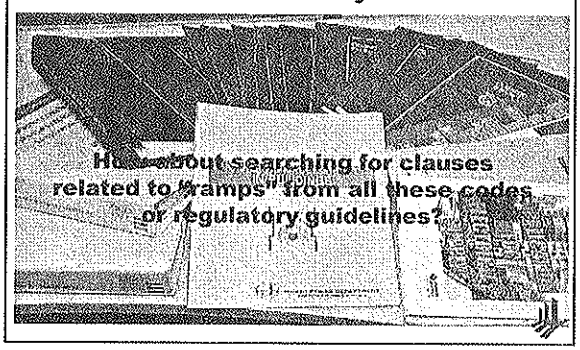


Why
CORENET
e-Information System?

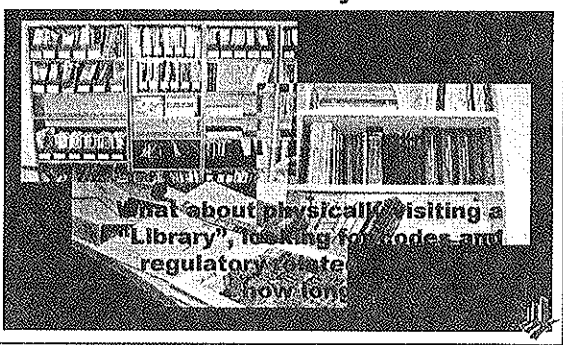
Situation without e-Information System



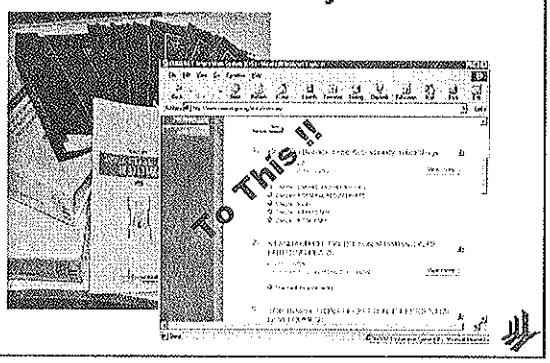
Situation without e-Information System



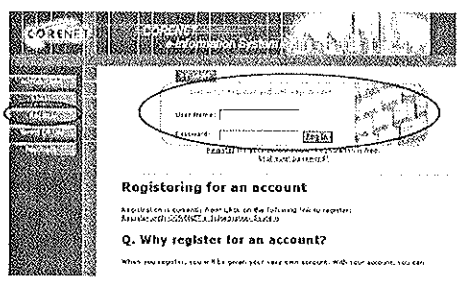
Situation without e-Information System



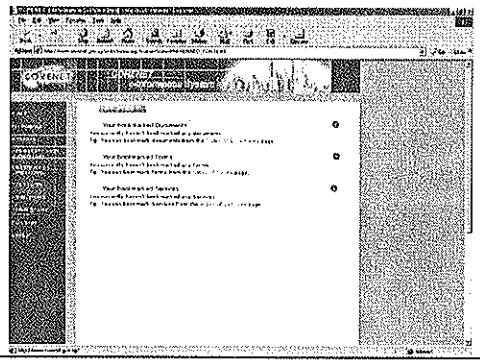
Current Situation with e-Information System



e-Information System Login Page



E-Info Home Page

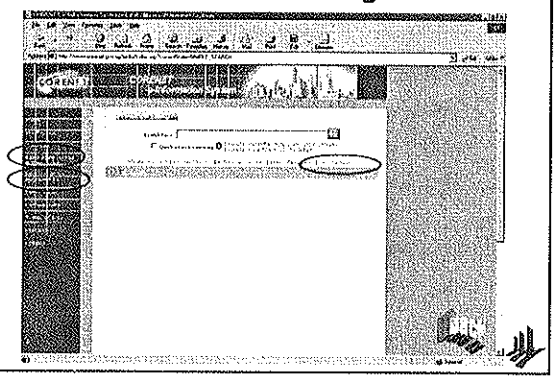


On-Line Functions in e-Info

On-Line Key Functions

- There are 3 main types of search categories
  - Regulatory Document Search
  - Circular Search
  - Construction Information Search

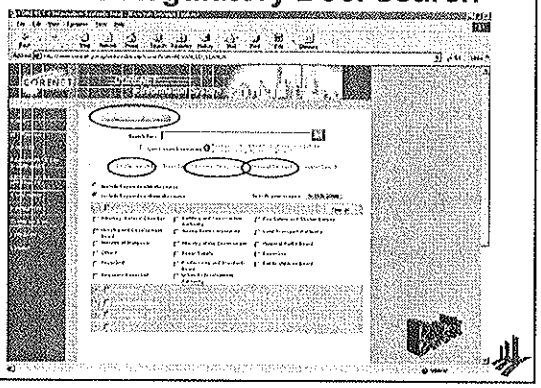
e-Info Search Categories



On-Line Key Functions

- Regulatory Document Search
  - Data consist of agency codes and regulations, guidelines, handbooks, standard, FAQ, etc
  - Ways of searching:
    - simple search
    - advance search
    - index of document
    - index of keyword

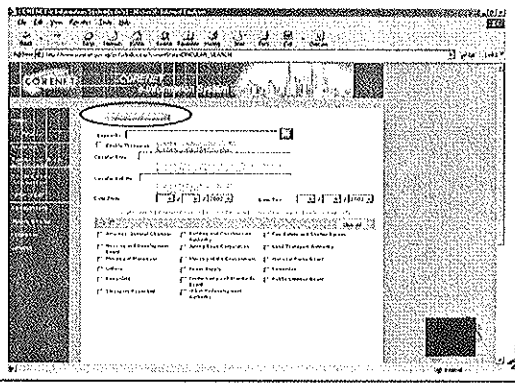
e-Info Regulatory Doc. Search



On-Line Key Functions (cont'd)

- Circular Search
  - circulars issued by various agencies
  - content is either in html or pdf format
  - Ways of Searching:
    - search by title
    - search by keyword
    - search by reference number
    - search by date

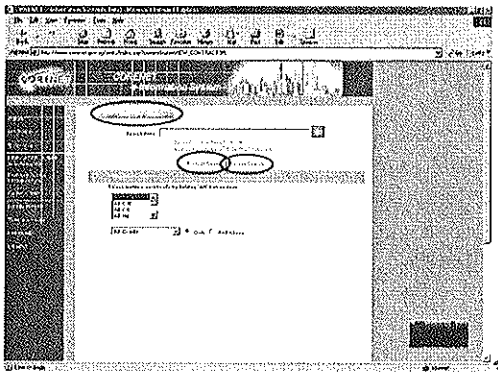
e-Info Circular Search



On-Line Key Functions (cont'd)

- Construction Information Search
  - contractor info
  - project info
  - supplier product info

Construction Info Search



On-Line Supporting Features

- My Profile
- Bookmark
- Services
- Forms
- Newsletters
- Feedback

For more information, please contact:

Building and Construction Authority

IT Development Department

Connie or Jeoffrey

tel: 6325 5003 or 6325 5907

e-mail: bca_corenet_einfo@bca.gov.sg

'Live' Demonstration

Website:
"www.corenet.gov.sg"



Thank You!



FISOPS – A tool for your benefit

By

Mr. Lim Yan Hong
Senior Manager, CSE Systems & Engineering Ltd

FISOPS - A tool for your benefit

Integrating Document Imaging and Business Workflow Processes

CSE Systems & Engineering Ltd
Lim Yan Hong

About FISOPS

- Fire Safety Online Processing System
- Web-based, Intranet Document Imaging and Workflow Application
- Integrates Document Imaging and Workflow Processes
- Interface with CORENET e-Submission

Objectives

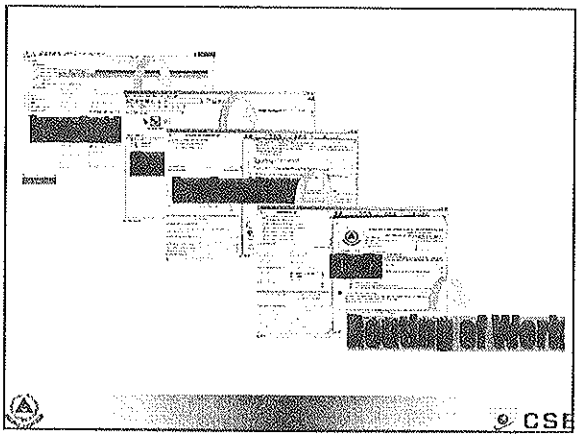
- Key Features of FISOPS
  - Document Imaging
  - Workflow Processes
- Benefits of FISOPS

Document Imaging

- What is Document Imaging
- Front-End Registration
- Back-End Image Processing
  - Scanning
  - Indexing
  - Quality Check (QC)



CSE



CSE

Document Imaging

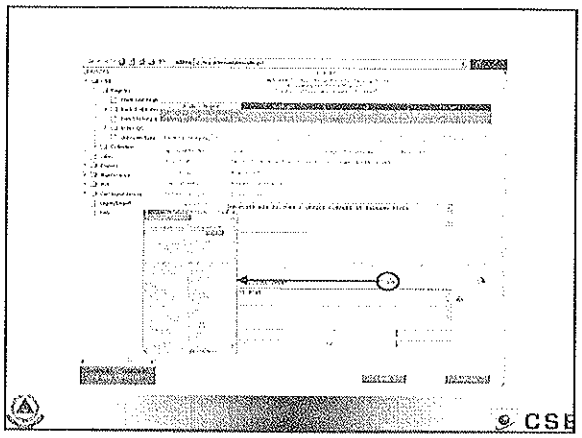
- What is Document Imaging
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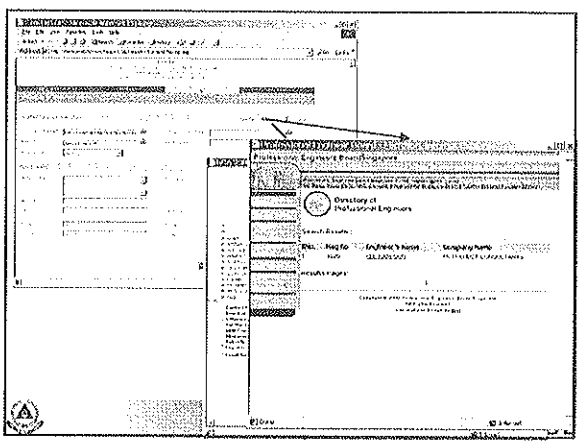


CSE

Front-End Registration

- Web-based Form Filling
  - Faster form filling
- Online Lookup Database Information
  - Completeness of information
- Online Verification of QP/PE Status against Board of Architect or Professional Engineer Board
  - Lookup for complete information





Document Imaging

- What is Document Imaging
- Front-End Registration
- Back-End Image Processing
  - Scanning
  - Indexing
  - Quality Check (QC)

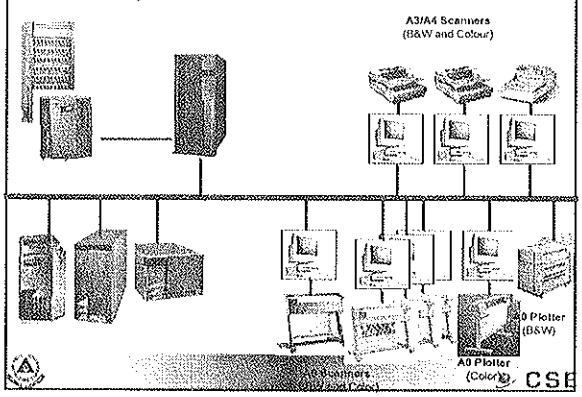
CSE

Scanning, Indexing, QC

- Scanning of Documents
  - A3/A4 (Color and B&W), A0/A1 (Color and B&W)
  - Allow all documents to be scanned into system
- Indexing
  - Enter Key Information for Images
  - For efficient searches
- Quality Check (QC)
  - Quality of Image
  - Ensure quality images are scanned into system
  - Completeness/Accuracy of Key Information
  - Verify that completeness and correctness of key information associated with each image

CSE

System Architecture for FISOPS



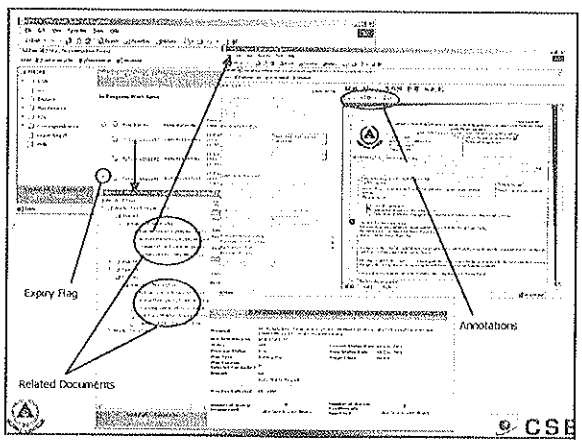
CSE

Evidence Act

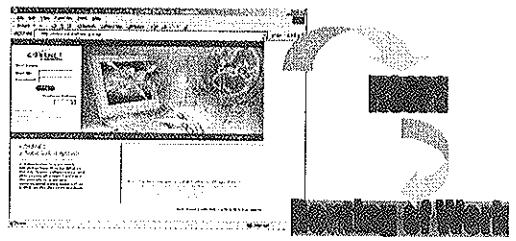
- Compliance with Evidence Act
  - Integrity and Reliability of Images
  - Document Imaging System is Certified
  - Documents Admissible in Court

Workflow Processing

- Work is Assigned and Routed to Relevant Officers *(InTray)* for Immediate Processing
  - All submissions are given immediate attention
  - Chances of unattended cases are minimized
- View Related Documents
  - Faster turnaround as there is no need to retrieve plans from store
  - Documents from related cases is fetched automatically
- Process / Monitor Case
  - Closer monitor and faster response time to query
- Work Routing from One Officer to Another
  - Collaborative participation between FSSB officers
  - No need for physical file transfer



CORENET e-Submission



- Automatic registration of submission into system

Summary of Benefits

- Allow Capture of Different Document
- Certified Document Imaging System
- Completeness of Information
- Cases Given Immediate / Close Attention
- Faster Turnaround Time
- Submission of One Set of Plans
- Integration to CORENET eSubmission

Thank You!

What more you need to know about Fire Code

By

Cpt Ng Kok Leong
Senior Processing Officer,
Plan Approval & Consultation Branch
Fire Safety & Shelter Bureau

What more you need to know about Fire Code 2002 Part I

1 Introduction

1.1 The changes/amendments that were approved over the years by the Fire Code Review Committee have been consolidated in the publication of the latest edition of the Code Of Practice For Fire Precautions In Buildings 2002 also known as Fire Code 2002

1.2 Some of the salient changes/amendments are presented in this paper, where further clarification will be given.

1.3 The following pages will describe in greater details the salient changes/amendments in the Fire Code 2002.

(A) Exit Access Door

1.2.25(B) A door which provides access to a room or space (excluding toilet cubicle, bedroom, storeroom, utility room, pantry and the like) or installed across the escape path leading to an exit. Exit access door shall comply with all the requirements of an exit door and need not have fire resistance rating, unless it is specified.

Doors that lead through wall panelling and that harmonize in appearance with the adjoining wall are not acceptable, as casual occupants may not be aware of such doors for means of escape even though actually visible. Exit access doors shall be designed and arranged to be clearly recognizable. As exit access door is a door which provides access to a room or space, for example, the entrance door to an office or doors installed across the escape path leading to an exit. It would be overly stringent if exit access door is required to comply with all the requirements of an exit door, except fire resistance rating if specified, for example, we would normally provide lock set to the exit access door to offices, but lock set is not allowed to be installed in exit door.

(B) External exit staircase

1.2.29(A) An exit staircase which serves as a required exit shall be located outside the building and open to the outdoor air, and enclosed by parapet walls or railing only.

(B) An external staircase shall qualify as an external exit staircase if it is located within or abutting an air-well (which is open to sky and is required to provide lighting and ventilation to the occupancy areas) having the minimum size in relation to the habitable height of the building as given in the Table 1.2.29 below :

Table 1.2.9 Minimum Air-well size

Max. Habitable Height of Building	Min. Clear width of Air-well
18m	10m
24m	11m
36m	12m
48m	13m
60m and above	14m

For an external staircase to be considered as an external exit staircase, the staircase must be:

(i) located outside the building;
(ii) open to the outdoor air; and
(iii) enclosed by parapet walls or railing only.

However, where the external staircase is located in an air-well, there is a need to determine the minimum size of the air-well in relation to the height of the building, before the external staircase can be accepted as an external exit staircase. The minimum air-well sizes are given in the above-mentioned Table 1.2.29(b). The staircase in the air-well shall not be affected by occupancies abutting the air-well.

The effective clear space to permit the upward movement of heat and smoke could be taken as that for a circle circumscribed by the walls of the air-well. The space within the circle shall be unobstructed space, open to sky, and shall have a diameter equivalent to the clear width of the air-well.

(C) External ventilation openings to External Exit Passageway

2.3.2 (c) (iv) An external exit passageway may be enclosed on the open side by only a parapet wall of not less than 1.0m or more than 1.1m I height and the vertical height of the unobstructed ventilation opening measured from the parapet wall up to the top edge of the opening or eaves of overhang shall not be less than 1.2m, and

The provision of 1.2m unobstructed opening above the parapet is to allow for good cross ventilation along the exit passageway or corridor. The height of the parapet shall not be less than 1m or more than 1.1m

(D) External ventilation openings to cross-ventilated lobby

2.4.5 (f) Provision for residential buildings exceeding 24m in height

Approach to the exit staircase shall be through cross-ventilated lobby. The ventilation openings having a minimum width of 2000mm and a minimum height of 1200mm shall be unobstructed from parapet wall or balustrade level upwards and be positioned on opposite sides of the lobby such that they provide cross-ventilation throughout the entire space of the lobby. Where multiple ventilation openings are provided on opposites sides of the lobby, the minimum width and height of each opening shall not be less than 1000mm and 1200mm respectively, provided the aggregate width of the openings at each opposite side is not less than 2000mm. See diagram 2.4.5(f)

Previously only the 2m horizontal width is stated. Some projects when completed had awning added over the ventilation opening to keep rain water out. As a result, the effective opening for cross-ventilation is affected. Present requirement under Fire Code 2002 specifies the minimum height of unobstructed opening to be not less than 1.2m.

Another important point to note is that the ventilation openings shall be located "on opposite sides of the lobby". This is to allow effective movement of air through the lobby. If the ventilation openings are located not in opposite sides, but diagonally to each other at an angle of >45 degrees, the layout is considered as not acceptable.

(E) Exit Staircase

2.3.3 (a) (ii) Internal exit staircase

Where an internal exit staircase is directly approached from an external exit passageway or external corridor, it shall not be necessary to provide such enclosure between the staircase and the external exit passageway or external corridor; and

(iii) There shall be no unprotected openings of occupancy area

within 1.5m horizontally or within 3m vertically below any part of the ventilation openings located in the external wall of the internal exit staircase.

The means of escape in the building would comprise 3 distinct parts : (i) the exit access,
(ii) the exit, and
(iii) the exit discharge.

During evacuation, occupants would make their way along the exit access to the protected escape staircase or exit and travel down the building and via the exit discharge to get out of the building into the safe exterior at grade level. The design of the exit shall comply fully with cl.2.3.3(a)(ii) and (iii) to prevent heat, smoke and hot gases from the fire floor from infiltrating into the exit staircase to affect the evacuees.

(F) External Exit Staircase

2.3.3 (b) (ii) there shall be no unprotected openings within 3m horizontally or within 3m vertically below, or adjacent or facing (unless there is adequate separation complying with cl.3.5) any part of the external exit staircase; and

Exception:

In building designed with external corridor access, the access to the external exit staircase shall be permitted by means of the open sided external corridor adjoining the occupancy areas, subject to the following :

(a) the external corridor shall be served by at least 2 exit staircases; and

(b) that unobstructed ventilation openings shall be provided along the long side of the external corridor above the parapet or balustrade.

Interpreting subclause 2.3.3(b)(ii), it would appear that external corridor that provides access to external staircases would need to be made protected from the occupancy area by fire rated walls/doors and window openings are to be located at least 1.8m above the finish floor level. However, under the exception clause, protection of the external corridor is not required if :

(i) corridor is served by at least two remote exit staircases such that it is possible for each upper storey occupants of all rooms to avoid having to travel pass any room that is on fire to reach one of the staircase,
(ii) the external wall to the corridor shall be unenclosed from the parapet or balustrade upwards

(G) Scissor Exit Staircase

2.3.4 (a) Where two separate internal exit staircases are contained within the same enclosure, each exit staircase shall be separated from the other by non-combustible construction having fire

resistance for a minimum period equal to that required for the enclosure, and

(b) Such scissors exit staircases shall comply with all applicable provisions for exit staircase, and

(c) Door opening into scissors exit staircase be at least 7m travel distance from each other.

Enclosures to exit staircases are permitted to be constructed of masonry or fire rated dry wall. However, for scissors exit staircases, clause 3.8.7(v) of Fire Code 2002 specifically prohibits the use of dry wall. The reason is that any breach of the enclosures to one staircase would affect the other as they are sharing one common shaft. Thus, the enclosures to scissors exit staircases shall be constructed of masonry.

The separation distance between the scissors staircases door opening shall be spaced at least ½ or $^1/_3$ (if sprinklered) of overall diagonal of the floor space under clause 1.2.60, subject to not less than 7m, as required under sub-clause 2.3.4(c).

(H) Custodian Care Facility

2.5.1 (c) A building or part thereof, used for the housing on a 24hour basis, of persons who, because of age, or physical mental disabilities, are unable to care for their self preservation and safety. Such buildings shall include nurseries for children under 6 years of age and institutions for the mentally disabled.

(i) Nurseries, including Childcare Centre, Kindergarten, if located within a building of mixed use, shall be compartmentalised from other spaces and occupancies by walls and doors having at least 1-hour fire resistance rating and provided with its own means of escape.

(ii) Institutions for the mentally disabled shall be designed with each storey having an area of refuge in accordance with Cl.1.2.4 and Cl.2.5.3. Fire safety requirements under Cl.2.5.1(a) – Hospital, shall be fully complied with, except Cl.2.5.1(a)(v) on Provision of escape bed-lift and Cl.2.5.1(a)(ix) on staircase landing width/depth

Occupants of custodian care facilities are generally capable of movement with limited assistance. They do not require to be evacuated in beds or stretchers, or bedsheets. As such, there is no need to apply Area of Refuge to Child Care Centres or Kindergarten as the premises would not be operated on 24 hours basis. However, the 2 exits with its own means of escape and fire separation from other commercial areas/spaces are not exempted from compliance. Routes leading to exit staircases outside the Child Care Centre shall be made protected to allow the children and staff to have orderly evacuation during any emergency

(I) Separation proscenium wall in Theatres or concert halls

3.9.3 (h) (i) In a place of public resort, such as theatres, and concert halls, capable of seating more than 500 persons and in which fly

tower is used for stage scenery or when extensive stage scenery may normally be installed on the stage side, the stage shall be separated from the seating area by a proscenium wall of not less than 1 hour fire resistance in such as way that the stage and the audience seating area form separate compartments.

(ii) The proscenium opening shall be protected by fire curtain with fire resistance of at least 1 hour, automatically operated by a fusible link or a smoke detector. In lieu of fire curtain, as smoke curtain is acceptable, if engineered smoke control and automatic sprinkler systems are t be provided to the stage area.

Previously, a fire curtain of minimum 1-hour fire resistance rating is required to be installed for the protection of opening between the stage and the seating area. Sub-clause 3.2.5(h)(ii) has been amended to allow an alternative compliance, to allow only smoke curtain to be used instead, if engineered smoke control and automatic sprinkler systems are provided to the stage area.

(J) Separation of spray painting room

3.2.5 (L) (i) Separations of spray painting room

Areas in which spray painting or other allied processes are performed or carried out, shall be separated form other parts of the same building by compartment walls and floors having fire resistance of not less than 2 hours. Where spray painting booths that have built in vapour extraction system complying with NFPA 33, the fire resistance requirement is not applicable.

(ii) Where a spray painting room or booth is protected by an automatic sprinkler system but not complying with NFPA 33, the fire compartment to the room or booth can be reduced from 2 hours to 1 hour.

The above sub-clause 3.2.5(L) has been expanded and clarified in the Fire Code 2002 to give recognition to spray painting booths that have built in vapour extraction system complying with NFPA 33. As the flammable vapour would be removed by the vapour extraction system, the enclosures to the booths are not required to be fire rated. However, if the spray painting booth is protected by sprinkler system but not complying with NFPA 33, the fire resistance rating to the enclosures of the booth can be reduced from 2 hours to 1 hour.

(K) Coldroom

3.2.5 (m) (i) Where a coldroom has a floor area exceeding 10sq m, a separate outer layer of non-combustible construction, including the door, having minimum 1-hour fire resistance rating, shall be provided to compartmentalise the coldroom enclosure from other areas

(ii) Provision of the fire resisting outer layer enclosure, including the fire door, to the coldroom would not be required if :

* The coldroom has a floor area not exceeding 20 sq m and is sprinkler protected in a building under Purpose groups IV, V, VI, VII or VIII, and the storage materials shall not

include highly flammable chemicals.

* The coldroom is located in a building under Purpose groups I or II.

* The coldroom is located in a kitchen compartment (with or without 'open flame' cooking appliances) in an eating establishment, provided the floor area of the coldroom does not exceed 20 sq m, and the kitchen is compartmentalised from other parts of the building by compartment walls and floor having minimum 1-hour fire resistance and door having minimum ½-hour fire resistance, irrespective of the relaxation allowed under cl.3.2.5(f)(v).

The main concern is the use of combustible insulation materials for the construction of the coldroom, such as polystyrene or polyurethane, which when subjected to fire would produce thick, poisonous fumes. Irrespective of the terminology of coldroom or freezer, as long as the core insulation materials used for the construction of the coldroom walls contain plastic foam and the floor area exceeding the 20 sq m in the mentioned purpose groups IV, V, VI, VII or VIII which are sprinkler protected, the above requirement on compartmentalization is to be complied with. Where a coldroom is required to be compartmentalised by 1-hour fire rated outer enclosure, there is no relaxation on the requirement to provide 1-hour fire rated door even if the building is sprinklered protected.

(L) Areas of Special Hazard

3.2.5 (O) (i) Boiler rooms, transformer, generator rooms, storage areas of materials that are highly combustible or flammable, and any other area of special high risk shall be separated from other parts of the building by compartment walls and floors having fire resistance of not less than 2 hours. If the building is protected by an automatic sprinkler system, the fire resistance rating of the compartment walls and floors can be reduced to 1 hour.

(ii) Rooms housing transformer containing flammable liquid and generator rooms shall be located against an external wall.

Under the Fire Code 2002, sub-clause 3.2.5(O) has been amended to allow the reduction of the fire resistance rating period for the enclosures to rooms of special hazard in building from 4 hours to 2 hours. Further relaxation to 1-hour is allowed if the rooms are protected by automatic sprinkler system.

The main reason for the change is that it is not necessary to fire rate the enclosures to these rooms well above the requirement for the elements of structure of the building. Due consideration is also given to the SCDF's fast response to fire call.

(M) Proposed new clause 3.9.3(b)

3.9.3 (b) Routing of gas pipes in basements

(i) All gas pipes that are routed in basement shall be API pipes with welded joints. These joints shall be 100% radiography checked in accordance with sub-clause 3.4.2(h) of SSCP 51. The gas pipe

are not required to be fire rated if they are running outside essential areas such as exit staircase, smoke stop or fire fighting lobby, fire pump room, generator room, fire command centre, etc. If they run into the essential area, they are required to be encased in masonry.

(ii) For mechanically ventilated basement, the gas pipes shall be provided with pipe sleeves for the venting of gas pipes. One end of the sleeve shall be exposed to the external as specified in sub-clause 3.4.29g) of SSCP 51.

(iii) For naturally ventilated basement that complies with sub-clause 6.4.1(d)(iii)(b), the provision of pipe sleeve is not required.

At a recent FSSB Standing Committee Meeting, a query was raised on whether gas pipes that are routed in basements need to be fire rated as the requirement on the protection of pipes is not specifically mentioned in the Fire Code. FSSB issued a circular on 26th Aug 2002 and the above proposed new sub-clause 3.9.3(b) would address the concerns of gas pipes in basements. An important point to note is that if the gas pipes are located in essential area, the pipes shall be encased in masonry construction.

(N) Protection of hydrant mains in buildings

4.4.3 All hydrant mains which pass through a building shall have its full length within the building protected with fire resistance construction complying with Cl.3.8.7(c) of at least the same fire resistance as the element of structure, provided the following requirements are complied with :

(a) The hydrant mains shall be located in common circulation areas, such as carparking spaces and driveways; ie they shall not pass through private or confined spaces;

(b) No services (except sprinkler pipes) shall be located above or crossing over the hydrant mains;

(c) The hydrant mains shall be located away from explosion risk areas; and

(d) The protective enclosure to the hydrant mains shall be labelled with the words "HYDRANT MAIN" of minimum 50mm height at suitable intervals.

Clause 4.4.3 has been amended to allow the hydrant main located within a building to be protected by fire rated materials. Previously, only masonry must be used for the protection of the main. The conditions imposed under 4.4.3(a) to 4.4.3(d) are to be complied with.

(O) Type of rising Main

6.2.1 (a) (i) Dry rising main shall be installed in buildings under purpose groups II, III, IV, V, VI, VII and VIII where the habitable height is more than 10m, but does not exceed 60m,

* *Subclause 6.2.1(a)(i) has been amended to require the provision of dry rising main when the habitable height of the building (except building under purpose group I) exceeds 10m, but not exceeding 60m. This change in requirement is to tie in with the proposed changes on the provision of fire engine access requirements under Chapter 4 of the Fire Code.*

* *Dry rising main (Dry riser) is a vertical pipe installed in a building for fire fighting purposes, fitted with inlet connections at fire engine access level and landing valves on various floors, which is normally dry but is capable of being charged with water usually by pumping from fire engine pumps.*

* *Dry rising mains are basically dry water pipes. The empty mains need to be charged with water through the breeching inlets by fire appliance. The dry rising mains should not exceed 60m to avoid excessive pumping pressure.*

* *Generally, building with a small foot print and the riser stack is located at the perimeter wall of the building, there is no need to provide landing valve at 1st storey level. However, if the riser stack is located deep inside the building, then landing valve is required to be provided at 1st storey level*

(P) Hose Reels

6.2.8 (a) Hydraulic hosereel conforming to the requirements in SS CP 29 code of Practice For Fire Hydrant System and Hose Reels shall be provided in every storey of every building regardless of building height, except the following:

(i) Purpose group I buildings;

* *Subclause 6.2.8(a)(i) has been amended to require the provision of hosereel to every storey of building under purpose group II, regardless of the building height.*

* *Residents of residential blocks can make use of the hose reel to fight incipient fire either inside a residential unit or in the communal area, eg. corridor, lobby or stairway, arising from discarded furniture or debris.*

* *Hosereel shall be provided in each building such that all areas of each storey of the building are within 6m from a nozzle attached to not more than 30m of hose, the distance to be measured along route suitable for the hose-line.*

* *Hosereel shall be sited in prominent and accessible positions adjacent to exits, preferably just outside protected corridors, lobbies or staircases on exit routes, but not inside staircases. Every storey is required to have at least one hosereel.*

* *The above change is to compensate the removal of the provision of fire engine access under Chapter 4.*

(Q) Proposed New clause 6.4.7

6.4.7 The "Guidelines on Reduced Water Storage For Automatic Fire

Sprinkler Systems in Buildings" are given in Appendix H. It provides an alternative design approach for the installation of sprinkler systems in both new and existing buildings under ordinary hazard category classification under SSCP 52: Code of Practice For Automatic Sprinkler System.

We have undertaken a study to review the water supply requirements for sprinkler systems in buildings that belong to the ordinary hazard category classification under SSCP 52 : Code of Practice for Automatic Sprinkler System. This review will facilitate the installation of sprinkler systems in existing buildings as reduced sprinkler water tanks would require less space and impose smaller loads on the building structure. The outcome of the study reveals that sprinkler water tanks sizes could be reduced, taking into consideration the response time of SCDF's fire fighting crew to fire incidents. The reduction in sprinkler water tank sizes translates into lower installation costs and space savings for building owners and developers who wish to or are required to upgrade the fire protection systems in the buildings. FSSB has issued a circular on 15 Nov 2001 to permit the immediate use of the above "Guidelines on Reduced Water Storage For Automatic Fire Sprinkler Systems in Buildings. See Annex A.

(R) Fire Engine Access Road and Accessway

Major changes/amendments to Chapter 4 of Fire Code

* *Fire engine hardstanding space of 6m X 15m has been deleted as the designated space was considered too restrictive*

* *Introduction of Fire Engine access road and accessway*

What is the difference ?

* *A Fire Engine Access Road is actually a road to allow a fire engine to move from one location to another within a development. Fire engine will not be pitched on Fire Engine Access Road.*

* *Minimum width of fire engine access road is 4m.*

* *The road shall be designed to sustain the passage of 30 tonnes fire engine.*

* *A Fire Engine Accessway is a metalled or paved road that is designed to withstand a loading capacity of a stationery 30 tonnes fire engine.*

* *Minimum width of fire engine accessway is 6m.*

* *Gradient shall not exceed 1:15*

* *Fire Engine Accessway shall be sited not less than 2m or more than 10m from centre position of access opening. See cl.4.2.2.*

Provision of Fire Engine Access Road

What is the meaning of "to every point on the projected plan area of the building"?

The measurement of the travel distance shall be the line of travel located outside the

building, and shall not traverse across open sided porches or 1st storey void deck. The travel distance is the distance that a fire fighter would traverse while carrying a portable ladder or equipment.

Provision of Fire Engine Access Road to residential buildings under Purpose group I – cl.4.2.2(a)(i)

Buildings under residential development purpose group I do not required fire engine road. The main reason is that fire fighting can be conducted from the public road. However, for cluster housing, which is defined as landed housing with shared communal facilities under purpose group I, fire engine access road (min 4m width) shall be provided. The fire engine access road shall be provided for access by pump appliance to within a travel distance of 60m from every point on the projected plan area of any building in the housing development.

Provision of Fire Engine Access Road to residential buildings under Purpose group II not exceeding 10m in habitable height – cl.4.2.2(a)(ii)

* *Clear width of fire engine access road shall not be less than 4m*

* *The fire engine access road for access by pump appliance shall be provided to within a travel distance of 60m of every point on the projected plan area of the building.*

* *Fire engine access road is not applicable to non-residential standalone building such as club house, car park, etc located in residential development under purpose group II*

* *To compensate the above requirement, hydraulic hosereel is now required to be provided under cl.6.2.8(a)*

Provision of Fire Engine Access Road to residential buildings under Purpose group II exceeding 10m in habitable height – cl.4.2.2(a)(iii)

* *There is no need to provide fire engine accessway*

* *Fire engine access road having a minimum width of 4m shall be provided. The fire engine access road shall be designed to sustain the load of stationary 30 tonnes fire engine. It shall be located not more than 18m from the breeching inlets sited at the external wall of the building*

Provision of Fire Engine Access Road to non-residential buildings under Purpose groups III, IV, V and VII not exceeding 10m in habitable height – cl.4.2.2(a)(iv)

* *There is no need to provide fire engine accessway*

* *Provision of fire engine access road having minimum 4m width for pump appliance will be required to within a travel distance of 45m of every point on the projected plan area of the building.*

Requirements of Access openings to building for fire fighting

Access opening :

- *Shall have a clear width of 850mm and a clear height of 1000mm*

- *As measured from inside finished floor level to sill height shall not be more than 1100mm and head height not less than 1800mm*

Signage :

- *The wording "Fire Fighting Access – Do not obstruct" is reduced from 50mm to 25mm. Provision of red or orange colour triangle sign to denote Fire Fighting Panel is not required if the building is fully glazed where opening is equal or larger than the Fire Fighting Access opening. The reason is that any part of the accessway can be used for the pitching of fire engine to allow fire fighters to gain entry into the building via any part of the external glazing. Any external wall, which faces the accessway is windowless or a blank wall, shall be provided with access openings at each storey level.*

Number and position :

- *For buildings under Purpose groups III, IV, V and VII exceeding the habitable height of 10m, access opening shall be provided at every storey level up to a habitable height of 60m, except 1st storey – subclause 4.2.3(f)(i)*

- *For buildings under Purpose groups VI and VIII, access openings located over the accessway shall be provided along the external wall up to a habitable height of 60m – subclause 4.2.3(f)(ii)*

- *Access openings shall be spaced at not more than 20m apart measured along the external wall from centre to centre of the access openings – subclause 4.2.3(f)(iii)*

- *Additional openings shall be required for buildings under Purpose groups III, IV, V, VI VII and VIII where an area or space has a ceiling height greater than 10m – subclause 4.2.3(f)(iv). The provision of access opening is not applicable to buildings under Purpose groups I and II*

Provision of Fire Engine Accessway to buildings under Purpose groups III, IV, V and VII exceeding the habitable height of 10m – cl.4.2.2(b)equirements of Access openings to building for fire fighting

4.2.2 (b) (i) Accessway shall be provided based on the gross floor area (including toilets, stores, circulation areas, etc.) of the largest floor in the building as follows:

Minimum	$^1/_6$ perimeter (min 15m)
2000m^2 to 4000m^2	¼ perimeter
>4000m^2 to 8000m^2	½ perimeter
>8000m^2 to 16,000m^2	¾ perimeter
>16000m^2	island site access

For buildings protected by an automatic sprinkler system, the floor area shall be doubled as follows:

Minimum	$^1/_6$ perimeter (min 15m)
4000m^2 to 8000m^2	¼ perimeter
>8000m^2 to 16,000m^2	½ perimeter
>16,000m^2 to 32,000m^2	¾ perimeter
>32,000m^2	island site access.

(ii) Accessway shall be provided to within 18m of breeching inlet for buildings that exceed the habitable height of 10m.

* *Previously, we need to find out the number of fireman access openings first, based on one opening per 620 sq m of the floor area. The number of access openings would be used to work out the length of accessway first and then distribute the access openings at not more than 20m, centre to centre of opening, along the external wall facing the accessway.*

* *As there is no designation of hardstanding space now, the whole stretch of accessway would be treated as "hardstanding". Hence, there is no need to impose the requirement that at least 2 sides of the building must be provided with accessway. The above requirement recognises the effectiveness of sprinkler system, hence, the floor area can be doubled in working out the accessway.*

* *To compensate the above requirement, rising main is required to be provided under cl.6.2.1(a)(i), if the habitable height of the building exceeds 10m.*

Provision of Fire Engine Accessway to buildings under Purpose groups VI and VIII – cl.4.2.2(c)

4.2.2 (c) The provision of accessway shall be calculated based on the following gross cubical extent of the building as follows:

Minimum	$^1/_6$ perimeter (min 15m)
>28,400m^3	¼ perimeter
>56,800m^3	½ perimeter
>85,200m^3	¾ perimeter
>113,600m^3	island site access.

For buildings protected by an automatic sprinkler system, the cubical extent of the building can be doubled as follows:

Minimum	$^1/_6$ perimeter (min 15m)
>56,800m^3	¼ perimeter
>113,600m^3	½ perimeter
>170,400m^3	¾ perimeter
>227,200m^3	island site access.

(ii) Accessway shall be provided to within 18m of breeching inlet for buildings that exceed the habitable height of 10m.

* *It is important to note that for industrial buildings, the gross cubicle extent*

is used for the calculation of the extent of accessway required.

* *Again, recognition is given to the effectiveness of sprinkler system. For buildings protected by an automatic sprinkler system, the cubical extent of the building can be doubled.*

* *As habitable height of building is not given, it would mean that for a single storey building, access openings are required to be provided to blank wall facing the accessway.*

* *To compensate the above requirement, rising main is required to be provided under cl.6.2.1(a)(i).*

Turning radius requirement of fire engine access road and accessway

Diagram 4.2.2(d)(v)

Turning Facilities for Pumper Appliances (24 tonnes)

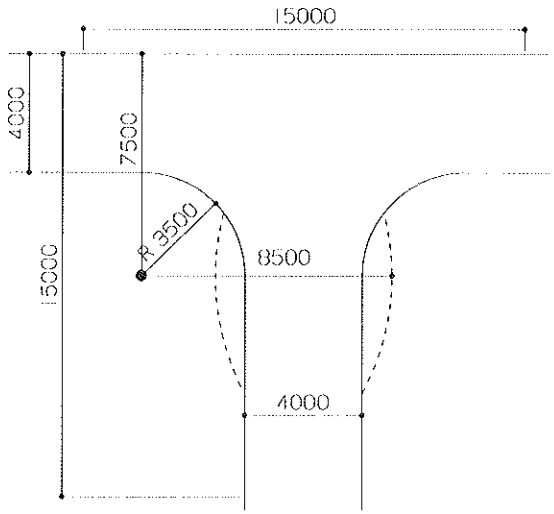


Diagram 4.2.2(d)(vi)

U-Turn Radii of Pumper Appliances (24 tonnes)

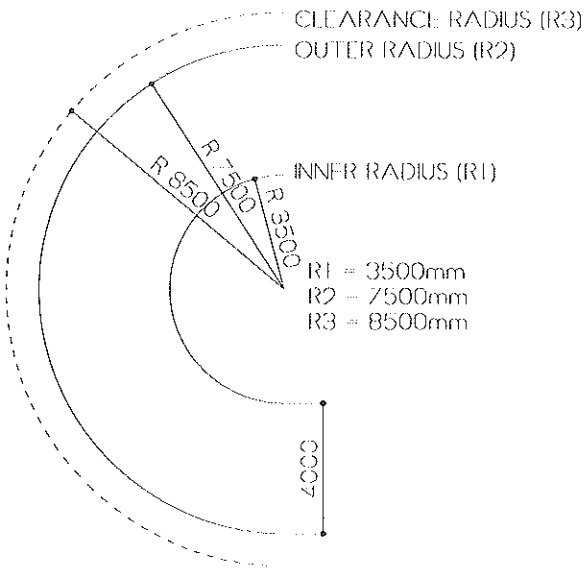


Diagram 4.2.2(d)(v)

Turning Facilities for Aerial Appliances (30 tonnes)
Applicable to buildings exceeding the habitable height of 10m

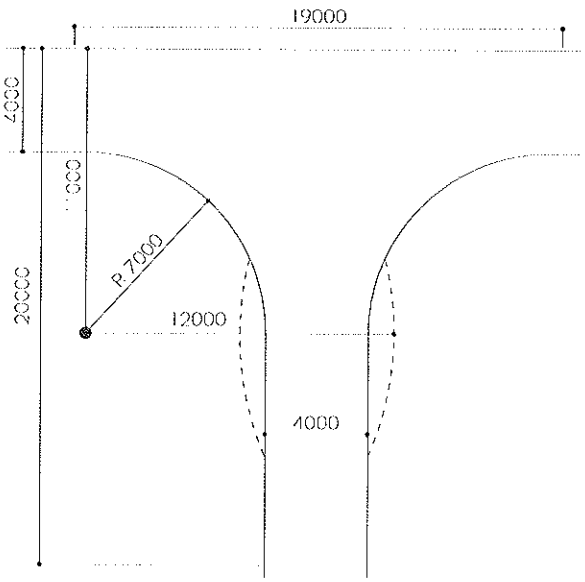
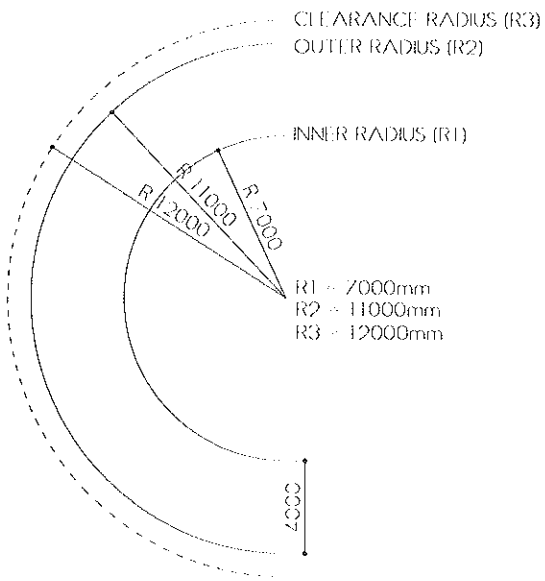


Diagram 4.2.2(d)(vi)

U-Turn Radii of Aerial Appliances (30 tonnes)
Applicable to buildings exceeding the habitable height of 10m



Water supply for Private hydrant – cl.4.2.2(a)

It is a common practice that the private hydrants system in a residential development would be connected in series with direct feed from the public main. Very often during peak hours, the private hydrant, remotest from the public main, will have inadequate pressure and flow rate. This is not desirable. Cl.4.4.2(a) permits private hydrants to receive direct water supply from the public water mains provided:

a) *Private hydrants are installed at RL 125 and below. Above RL 125, the PUB water department, is unable to guarantee the performance of the supply in the public water main.*

b) *The nominal bore of the private hydrants pipe and the bulk water meter shall not be less than 150mm in diameter.*

c) *The running pressure/flow at the hydraulically most unfavourable hydrant of the private hydrant system shall comply with the following :*

* *Running pressure >= 0.9 X (running pressure of the nearest public hydrant – pressure drop across the bulk water metre) ; and*

* *Flow rate >= 0.9 X water flow of the nearest public hydrant or >=total flow demand (as required in Table 4.4.2) of the private hydrant system, provided th running pressure at the remotest private hydrant is greater than 2 bars.*

Note :

(i) *In calculating the frictional loss for the private hydrant system, the design flow rates shown in Table 4.4.2 shall be used.*

(ii) *Pressure drop across bulk water metre shall not be more than 1 bar.*

Water supply & storage requirements for Private hydrant located above RL125– cl.4.2.2(c)

Cl.4.2.2 (c) Where more than one private hydrants are located above reduced level 125m within the same plot, storage and pumping arrangements of water supply to these specified hydrants shall comply with those for wet rising mains stipulated in SS CP 29 and Table 4.4.2 – Water Supply & Storage Requirements For Private Hydrant. The water supply for hydrants serving residential and non-residential developments shall be as follows:

Table 4.4.2 – Water Supply & Storage requirements For Private Hydrant

Purpose Group/Requirement	Purpose Group I & II	Purpose Group (*) III, IV, V, VII	Purpose Group (*) VI & VIII
Minimum running pressure	2 bars	2 bars	2 bars

Minimum flow rate	27 L/s	<1000m² - 38L/s <5000m² - 57L/s <10000m² - 76L/s (57L/s if sprinkler protected) Additional 19L/s for subsequence 5000 m²	500m² - 38L/s <5000m² - 57L/s <10000m² - 76L/s (57L/s if sprinkler protected) Additional 19L/s for subsequence 5000 m²
Minimum duration	45 mins	45 mins	90 mins

* Based on the floor area of the largest compartment in the building

* *An additional category has been created for industrial buildings as the fire load would be higher than non-industrial buildings. For this reason, the minimum duration period for water supply for industrial category is 90 minutes, twice that for non-industrial buildings.*

* *The minimum running pressure has been reduced from 3.5 bars to 2 bars for all purpose groups.*

* *For purpose groups I & II, the minimum flow rate has been reduced from 38L/s to 27L/s.*

3 Conclusion

3.1 Clarification on the changes/amendments to the Fire Code would help the QPs/SCDF and public at large to have a clear and uniform interpretation of the requirements and rationale of the respective clauses in the Fire Code.

Annex A

GUIDELINES ON REDUCED WATER STORAGE FOR AUTOMATIC FIRE SPRINKLER SYSTEMS IN BUILDINGS.

1 INTRODUCTION

1.1 The primary purpose of these guidelines is to facilitate the installation of sprinkler systems in existing buildings that are not already protected by sprinkler system and that are in the Ordinary Hazard I, II & III classification. They are also applicable to new buildings having similar hazards. With the timely response by the SCDF, the designated water storage capacities in these guidelines should be adequate for the sprinkler system to control the fire spread till the arrival and the intervention by fire fighters.

1.2 An automatic sprinkler system is expected to provide sufficient evacuation time for the building occupants, assist in preventing fire spread to adjacent spaces/ buildings, limit the environmental impact of fires and provide limited property protection. However, please note that these guidelines set out the minimum water supply requirements for life safety only and not for property protection.

2 GENERAL

2.1 These guidelines shall be read in conjunction with Singapore Standard CP 52: 1990, CODE OF PRACTICE FOR Automatic Fire Sprinkler System [SSCP 52]. Where conflict exists with between CP 52 and these guidelines, the requirements in this guideline shall take precedence.

2.2 In adopting these guidelines in the design of the automatic fire sprinkler system, the QP should inform the Building Owner the limitations of reduced water storage capacities as allowed in these guidelines, prior to the design and installation of the system.

3 SCOPE

3.1 The requirements in these guidelines are only applicable to buildings having hazard classification of Ordinary Hazard Group I,II or III under SSCP 52.

3.2 These guidelines shall only be applicable to buildings of habitable height not exceeding 60m.

3.3 The requirements in these guidelines do not apply to any building housing storage risks and chemical processes.

4. DEFINITIONS

4.1 Reliable Inflow

The inflow to the sprinkler tank is considered reliable if the water inflow rate at the inlet to the sprinkler tank is not less than 1.0 m^3 / min and the inlet point is located at reduced level 125m or below.

4.2 Unreliable Inflow

The inflow to the sprinkler tank is considered unreliable if the water inflow rate at the inlet to the sprinkler tank is less than 1.0 m^3 / min or the inlet point is located at reduced level greater than 125m.

4.3 Non-modulating type pilot control float valve

PUB approved float valve that is designed to open fully when there is a drop in water level to immediately replenish the tank.

4.4 Constant flow pressure reducing valve

A listed device incorporated in the sprinkler pipe network to ensure that the design flow limitations of the system are not exceeded.

5 DESIGN CONSIDERATIONS

5.1 TANK SIZING

The minimum water storage capacities of the sprinkler tank shall be capable of providing 30 minutes adequate water supply for the sprinkler pump operation.

5.1.1 System with Reliable Inflow

For sprinkler system with a constant reliable inflow from the PUB mains to replenish the sprinkler tank, the effective tank storage capacities for the various hazard categories shall be as follows :-

TABLE 1 : Effective tank capacity for reliable inflow		
Occupancy Group	System demand **	**Proposed minimum effective capacity of storage tank**
OH 1 [72m^2]	540 l/min	**12.5 m^3**
OH 2 [144m^2]	1000 l/min	**25.0 m^3**
OH 3 [216m^2]	1350 l/min	**37.5 m^3**

** the upper limit in column 6 of Table 16 CP 52

5.1.2 System with Unreliable Inflow

For sprinkler system with an unreliable inflow from the PUB mains to replenish the sprinkler tank, the effective tank storage capacities for the various hazard categories shall be as follows :-

TABLE 2 : Effective tank capacity for unreliable inflow		
Occupancy Group	System demand **	**Proposed minimum effective capacity of storage tank**
OH 1 [72m^2]	540 l/min	**16.2 m^3**
OH 2 [144m^2]	1000 l/min	**30.0 m^3**
OH 3 [216m^2]	1350 l/min	**40.5 m^3**

** the upper limit in column 6 of Table 16 of SSCP 52

5.2 PIPE SIZING

Full hydraulic calculation methods shall be adopted for the design of the sprinkler system pipework. The sprinkler design must ensure that the flow does not exceed the system demand as stipulated in Table 1 & 2, throughout the installation. The flow and pressure limitations can be overcome by employing listed constant flow pressure reducing valves or by including orifice plates at connections to main distribution pipes.

6 WATER SUPPLY

6.1 Size of incoming mains

Pipe size of the replenishing water mains to the sprinkler storage tank shall not be less 150 mm in diameter. Hydrants, hosereel and external drenchers shall not be connected to the sprinkler system or draw from sprinkler water supplies.

6.2 Inlet to storage tank

The inlet to the storage tank shall be fitted with listed non-modulating type of pilot float valve.

PART II
REVISION TO FIRE SAFETY REQUIREMENTS FOR WAREHOUSES

I. INTRODUCTION

Singapore is positioning itself to be an international logistics hub. In working towards this, the Singapore Civil Defence Force is reviewing its fire safety requirements for warehousing functions in order to meet the evolving needs in this sector.

We need to examine the driving factors for the proposed changes in the regulations:-

1. There is a growing need for expansive and inter-connected storage spaces to cater for today's operational warehousing requirements, which presents an entirely different set of fire risks from the general warehousing requirements a decade back.

2. In the area of active fire protection, automatic sprinkler systems have been shown to provide reliable and effective protection of property, while enhancing life safety at the same time. Sprinkler technology has also improved over time, with new products such as ESFR sprinklers being introduced along the way.

3. Over the years, SCDF has continually improved on its operational capabilities in mitigating major incidents, which we can leverage on to review our present requirements on warehousing.

Based on the above considerations, it is timely therefore to revamp our present requirements to cater for today's warehousing needs.

II SCOPE

The present mega-warehouse requirements will be reviewed, following industry feedback that increasingly warehouses require continuous areas and cubicle extents beyond that stipulated in the existing guidelines.

The terminology "mega-warehouse" will be removed to eliminate any perceived ambiguity. In the new proposed guidelines, only the term 'warehouses' will be employed for all such buildings designed the purpose of storing goods.

III CONSIDERATIONS

Classifying Warehousing Risks

Table 3.2A in the Code of Practice for Fire Precautions in Buildings 2002 spells out the size limitation of a building and its compartments, beyond which sprinkler provision is necessitated.

In applying Table 3.2A requirements to high hazard occupancies, the quoted limits in the table are halved, taking into consideration the much higher fire risks posed by such storage.

Currently, there is no distinction made between normal building occupancies with typical hazard storage, eg offices, classroom and the like, and warehouses storing non-high hazardous materials, although it is clear that the latter poses a much higher fire risk.

It is legitimate then to create a separate intermediate classification for general warehouses, between high hazard storage and normal non-warehouse storage. In terms of Table 3.2A figures on maximum areas and cubicle extents, this translates to an applied fraction more than ½ but less than 1. However, to cater for the uncertainty in the type of storage that can be expected for general warehouses, the proposed fraction is 2/3 of Table 3.2A requirements, instead of ¾ which is the midpoint.

Requirements based on Degree of Difficulty of Fire-Fighting Operation

The rationale behind the new proposed regulations stems from the basis of relative difficulty of fire-fighting, ie faster containment of fires with decreased difficulty of fire-fighting. This is in accordance to the code intention behind Table 3.2A, which is, the extent of the anticipated fire should not develop beyond the ability of the fire brigade to control it.

Where Table 3.2A limits on area and cubicle extent are exceeded, the existing code allows for the provision of automatic sprinkler systems to keep any incident fire in check, either by controlling or suppressing it altogether, such that it will still be within the means of the fire brigade to handle.

On this basis, warehouses will be classified in ascending ease of fire fighting, as follows:-



1. Multiple-storey warehouses without ramp
2. Multiple-storey warehouses with ramp
3. Single-storey warehouse

The maximum allowable sizes on area and cubicle extent will commensurate with decreasing difficulty of operational fire-fighting. SCDF expects that the new figures for limits on allowable area and cubicle extent will be able to meet the needs of most, if not all, warehousing needs without compromising on our operational capability to mitigate any incident fire.

From an operational standpoint, multiple-storey warehouses without heavy vehicular ramps pose the greatest relative difficulty in tackling the fire, as fire fighters will have to use the stairway and fire lift, if at all available. With heavy vehicular ramps, the pumpers are able to access the fire floor. Reinforcements can be brought speedily to the incident site when required. Single-storey warehouses allow the incident commander and fire crew better control of the ground. The improved co-ordination of fire fighting efforts for single storey warehouses, in relative comparison with multiple-storey, provides SCDF leeway to allow for more relaxation on area and cubicle extent limits.

Fireman Access Platform with Door Access (FAPD)

The fireman access platform, with accompanying cat ladder, will still be a necessary feature for access to isolated warehouse units for which there is no direct FAP access through the corresponding accessway.

The access platform shall be of 2m depth x 3m length, which may be of metal non-combustible construction. Cat ladder leading to the FAPD must have guardrail of 1.5 meters diameter. The FAPD shall remain free of any storage.

FAPDs may be protruding or recessed into the building, with minimum clearance of 1.5m from unprotected openings. The fire wall that separates the FAPD from occupied areas shall be minimum of 2-hr rated up to 2.1m from the floor of the platform.

Extinguishers

Provision of extinguishers for industrial premises, which includes warehouses, is deemed to be adequately addressed by CP55. As such, the existing requirement for 50kg ABC dry powder extinguisher with 25m hose will no longer apply.

Use of Fire-Rated Roller Shutters to meet Compartmentation Requirements

Fire-rated roller shutters act as a secondary form of limiting fire spread in the unlikely event of total sprinkler failure or the inability of sprinkler action to curb fire growth. Fires in non-sprinkler protected premises can grow rapidly without any means of fire suppression, even with the provision of fire-rated roller shutters. Therefore fire-rated roller shutters will not be permitted for use in non-sprinkler-protected warehouses to compartmentalise the space below Table 3.2A limits for exemption on sprinkler provision.

In other words, fire-rated roller shutters is only allowed for fire compartmentation in sprinkler-protected warehouses.

Automatic Smoke Vents and Engineered Smoke Control Systems

Smoke removal from the fire compartment allows better visual appreciation and tackling of the fire by fire fighters, and allows for faster location of deep seated fires where the warehouse footprint is extensive. It also serves to remove heat from the upper hot smoke layer, thereby reducing radiant heat reflecting downwards which could accelerate fire growth.

Regardless of sprinkler provision, smoke vents will be required for all warehouses below a certain area quantum, beyond which engineered smoke control systems becomes mandatory.

Two-Way Voice Communication System

Voice communication permits better co-ordination of fire-fighting efforts within the building.

The present Fire Code 2002 requirement on two-way emergency voice communication for warehouses with gross floor area more than 5,000 m^2 or habitable height more than 24 m applies.

IV CONCLUSION

SCDF is making every effort to anticipate and meet today's warehousing needs and in the process fulfil Singapore's vision to be an international logistics hub. We hope that the coming changes will help move our industry towards that direction.