

# **RISK MANAGEMENT IN FIRE AND ACCIDENT INSURANCE**

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Mr Chairman, Ladies and Gentlemen

It is a great honour to me to discuss "risk management", one of the terms that the insurers talk about frequently but most likely overlook, for next few minutes

First of all, I would like to introduce to you Korean Fire Protection Association (KFPA) which I am working for. KFPA was established on May 15, 1973 jointly by 10 non life insurers in Korea by virtue of the "Law on Indemnity for Fire Losses and Completion of Fire Insurance Contract", with its major functions as follows



- 1 Fire safety inspection
- 2 Fire protection activities including education or enlightenment of the public
- 3 Donation of fire fighting equipment
- 4 Mandatory insurance business on "specific buildings", etc
- 5 Loan of fund to makers of fire protection system or specific building owners, etc
- 6 Other functions as designated by the Minister of Finance

As the functions of KFPA are such, I prefer to mention risk management with emphasis laid on fire protection rather than touching overall aspects of it

As you know very well, the rapid development of economic conditions and modern technology have greatly contributed to the change of patterns of social movement, thus they have added enlarged facets to the risk management problem including fire protection. During the past few decades, especially, the insurers of the most countries of the world have been suffered by catastrophic fires. In case of Korea, the average number of fires which caused property losses of US\$20,000 or more were only 14 percent of the total fires during the past 3 year period from 1974 through 1976, but it accounted for 84.5 percent of the total property losses.

(Fig 1) Fires causing losses of US\$20,000 or more in Korea ('74 - '76)

Year	Number of Fires (A)	Property Losses (B)	Fires causing loss of US\$20,000 or more		Percentage $\left(\frac{C}{A} \times 100\right)$	Percentage $\left(\frac{D}{B} \times 100\right)$
			Number of Fires (C)	Total Property Losses (D)		
1974	3901	34,419,189 8	58	32,387,755 1	1 5%	94 1%
1975	4259	12,374,761 2	78	10,130,612 2	1 8%	81 8%
1976	4712	17,093,463 2	48	13,246 938 7	1 0%	77 5%
Average	4291	21,295,864 7	61	18,588,435 3	1 4%	84 5%

In case of the United States of America, fires producing property losses of or more US\$250,000 were only 1 4 percent of the total fires in the year of 1973, but accounted for 66 percent of the total losses. The situation, I presume, is quite similar in most other countries.

We, as those who are engaged in insurance industry, cannot but give our deep concern about such serious situation as this, not because risk management gives benefit to all concerned, but because we have responsibilities, at least from moral point of view, for prevention of losses.

#### CAUSES OF LARGE-LOSS FIRES \*1)

Someone would neglect the current situation by saying that large losses by fire are not peculiar to our times but have always occurred, and the increasing claims are mainly due to a result of inflation. However, we should remember that there has been a continuous increase in the sums involved in fire losses which far exceeds that due merely to inflation. Fire specialists warn that this trend towards large fire losses should not be regarded as an accident but is definitely due to certain development, especially during the past few years. \*2)

The major causes of large fires pointed out by fire problem experts are as follows:

- Increase of arson due to moral corruption
- Concentration of high values in confined spaces
- Increase of automatic processes in factories
- Large buildings not divided by proper fire walls
- Rapid proliferation of new combustible building materials
- Insufficient standards and codes
- Introduction of modern hazardous production methods

In spite of rapid development of modern technology, it is regrettable that we can hardly witness any signs of substantial improvement in the field of fire protection and other risk management science.

#### GNP vs FIRE LOSSES

It is a well known fact that the trend of financial losses by fires in any country can usually

\*1) *The concept of a large loss fire varies with the countries*

*In the United States of America for example a large loss fire means one causing \$250 000 or more damage to the property. In Korea until recent year it meant a fire causing about 20,000 US Dollar or more damage to the property.*

\*2) *Heinz Behr "Fire Loss Trends in Industry", MunichRe 1974*

be correlated with the economic development of that country, expressed in terms of the gross national product (GNP) \*3)

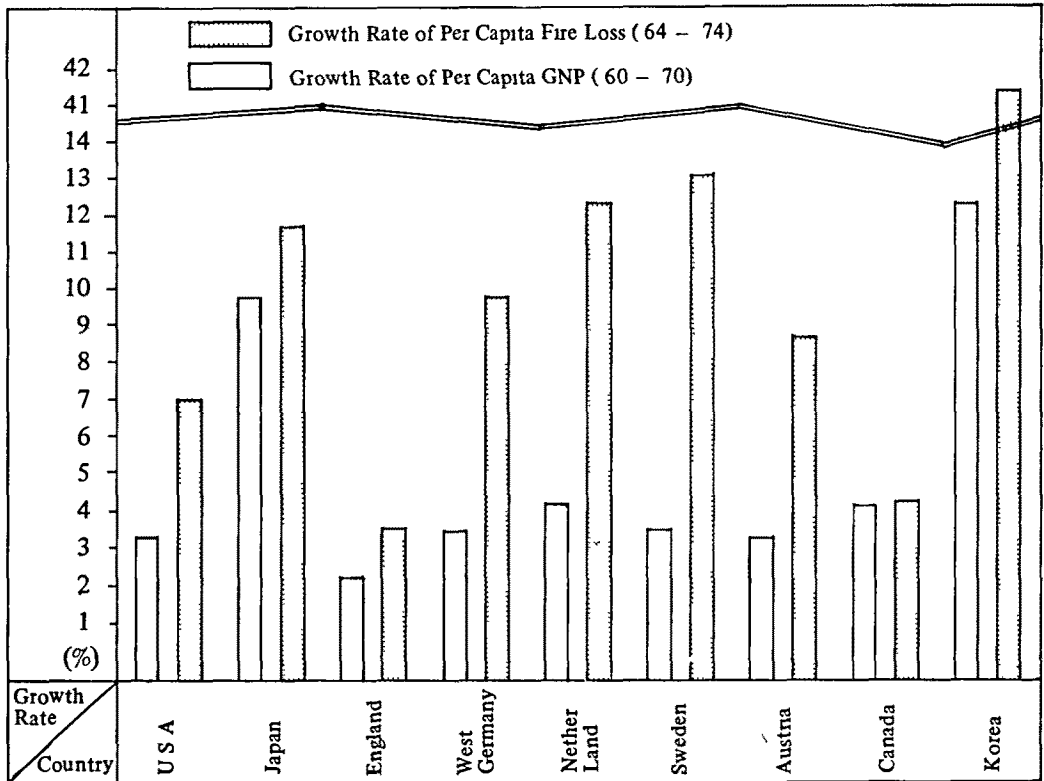
First, we can see the upward trend of loss amounts is somewhat higher than the economic development when we compare shares of fire losses in the gross national product in many countries. Figure 2 shows trend of fire losses comparing with the gross national products of several countries. This figure could be slightly different depending on their sources. We, however, think that we can at least conjecture the general trend from this figure.

Second, we can learn the upward trend of fire losses by studying another statistical data, an international fire losses expressed as percentage of each country's GNP, the combined goods and services produced in a country in a year.

Figure 3, presented by the National Fire Protection Association (NFPA), shows international fire losses as a percentage of the GNP of each country since 1950 until 1974. As we can see from this figure, fire losses occupies 0.07 – 0.32 percent of the GNP in several countries. Munich Reinsurance Company (MunichRe) prepared another figure (Fig 4) based on 1950 – 1970 statistics. This figure is basically same as the one presented by NFPA in every respect.

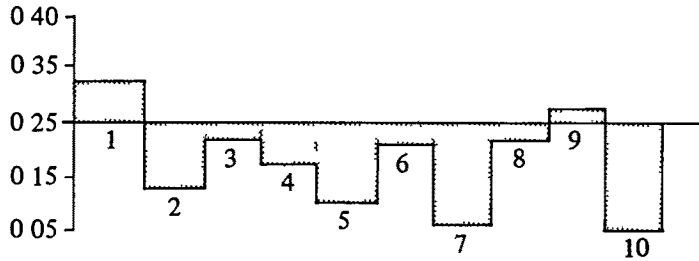
(Fig 2) Growth Rate of Per Capita Fire Loss vs Growth Rate of Per Capita GNP

The growth rate of per capita fire loss is based on an average number of 11 year period from 1964 through 1974, however, the growth rate of per capita GNP is an average number of 11 year period from 1960 through 1970. (Sources: Dong A Yearbook, NFPA, Ministry of Home Affairs)



\*3) Schaden Spiegel 1973 December issue MunichRe P 101

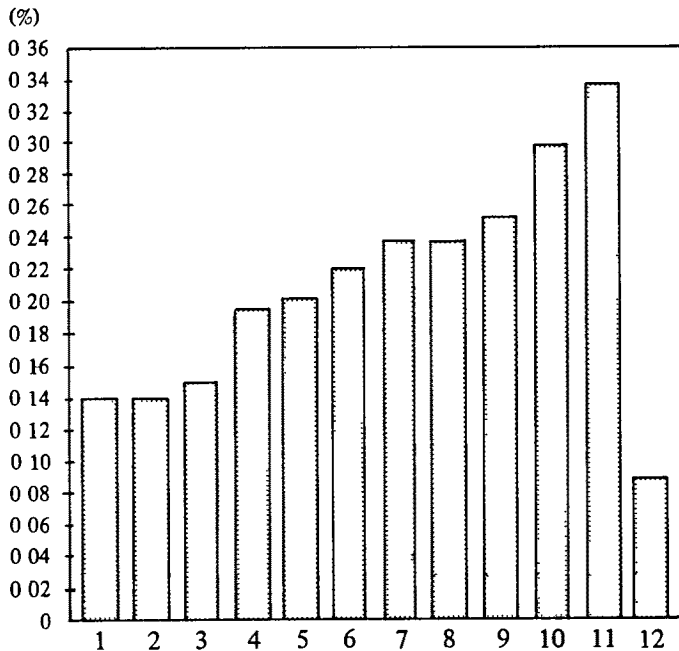
(Fig 3)



International fire losses expressed as a percentage of each country's gross national product (1950 - 1975)

- |             |                      |               |                  |
|-------------|----------------------|---------------|------------------|
| 1 Australia | 2 Austria            | 3 Canada      | 4 Finland        |
| 5 Japan     | 6 Netherlands        | 7 Switzerland | 8 United Kingdom |
| 9 USA       | 10 Korea (1968-1975) |               |                  |

(Fig 4)



The fire loss ratio of several countries averaged over the years 1950 to 1970 (% of GNP)

- |               |           |                 |                      |
|---------------|-----------|-----------------|----------------------|
| 1 Austria     | 2 Japan   | 3 West Germany  | 4 Sweden             |
| 5 New Zealand | 6 Finland | 7 Great Britain | 8 Denmark            |
| 9 USA         | 10 Norway | 11 Australia    | 12 Korea (1968-1975) |

However, we should remember that these figures are based on the experiences from 1950's to 1970's. How is the recent statistics only then? It is regrettable that individual country's up to date statistics is not available to me, but I have learned from a fire problem specialist that fire losses expressed as a percentage of each country's GNP in advanced countries is about 0.5 percent or more in recent few years! Surprisingly enough some fire experts expect it would reach 1.0 percent in the near future! \*4)

To sum up the upward trend of fire losses is obvious. Let me take an example from Korea. Korea marked only about 0.06 percent during the 6 year period from 1968 through 1973. However, when a large textile plant (Yunsung Textile Co.) was completely burnt in 1974, the percentage jumped up to 0.25 at once (Fig. 5)

(Fig. 5) Fire Losses Vs GNP in Korea

Year	GNP (US\$)	Fire Losses (US\$)	Fire Loss as a Percentage of GNP
1968	3,261,306,122.4	3,087,755.1	0.09%
1969	4,248,000,000.0	3,175,510.2	0.07%
1970	5,284,204,081.6	4,210,204.0	0.08%
1971	6,431,734,693.8	4,461,244.4	0.07%
1972	7,877,551,020.4	3,308,163.2	0.04%
1973	10,058,510,204.0	3,140,816.3	0.03%
1974	13,834,918,367.3	34,418,367.3	0.25%

What do these statistical data mean? It means that the more a country's industry modernizes, the more it is susceptible to fire losses.

## TO REDUCE FIRE LOSSES

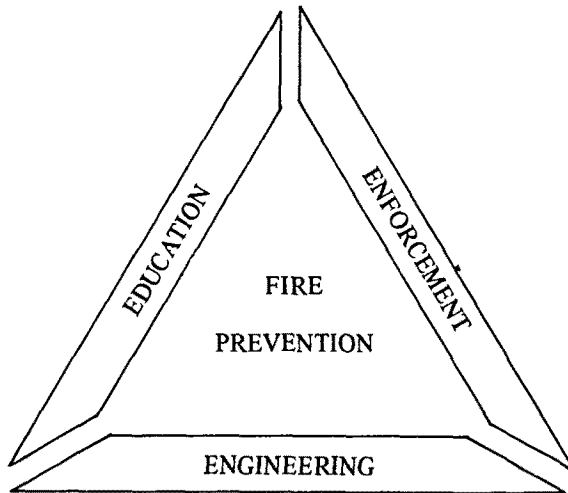
In order to reduce losses by fire, three aspects should be considered, fire prevention, fire detection, and fire extinguishment. Among these, "fire prevention" should be our object to be specially emphasized on.

Through its last report entitled "America Burning", the US National Commission on Fire Prevention and Control whose activities were terminated in 1973, asserted most positively that the best way to reduce human life and property losses by fire was to use more time and money to prevent fires. This is merely a new confirmation of an old well known truth.

Fire prevention activities generally include public education, assistance in training industry for self protection, supervision of safety of public assembly, participation in revision of laws and fire regulations, licensing of hazardous process and storage, inspection of premises, enforcement of regulations, investigation of fires, and disposition of arson cases. \*5)

\*4) Refer to Un Hoe Park's article entitled "Looking Fire from Insurance Industrial Point of View" *Firesafety Inspection Magazine*, Vol 2 (June 1974) KFPA P 14

\*5) Boris Laimig *20th Century Fire Protection* *Fire Journal* 1965 July issue NFPA P 31



(Fig 6) The Three E's of Fire Prevention Activities

These activities can be simply categorized as engineering, educational, and enforcement functions. The line drawing (Fig 6) illustrates how these functions relate to fire prevention. And among these three functions, engineering plays an extremely important role. \*6)

However, it is also true that insurance industry has neglected the engineering aspect in their management system so far.

## VARIOUS EXPERIENCES

As men are surrounding themselves with ever increasing combustible and hazardous materials, and they are confronting with a deluge of ever newly developing industrial processes, insurers have eventually become confused. They felt keenly that they could not rely upon the past experiences only. They, at last, felt that they should leave finger-counting management system but should adopt a revolutionary scientific method.

I would not allude to the successful story of US Factory Mutual System (FM) which adopted vigorous engineering system, in their insurance business since the last century in details. However, I, at least, hope you to pay attention to their very effective risk management method, or active engineering activities represented by inspection, education, research and test, and they are, I firmly believe, no other than flowers of the loss prevention engineering, or the key of the FM's success.

It is very interesting to hear that FM insists their loss ratio has been decreased to 1/20, compared with the figure of the early 20th century. It is also surprising that in Switzerland, where the Swiss Fire Prevention Association offers inspection service to its subscribers, firms adopting the service have had the half average loss of non subscribers. Although I do not have any idea of the basis of their statistics, these are, without doubt, no other than strong testimonial to active risk management.

\*6) *Fire Prevention and Inspection International Fire Service Training Association 1974*  
P 13

## A CASE IN KOREA

In order to prevent losses in human life and property caused by fire, and to secure speedy recovery from such losses, and also to provide compensation for fire victims, the Government of the Republic of Korea enacted and promulgated a special law entitled "The Law on Indemnity for Fire Losses and Completion of Fire Insurance Contract" in February 1973 under which KFPA was established as aforementioned. By this law, the owners of "specific buildings", in seven major cities throughout the country are under an obligation to insure their own buildings with non life insurance companies against losses of human life and property from fire. At the same time, the owners of the specific buildings are obliged to comply with fire safety inspection conducted by KFPA inspectors by the law.

Under the circumstances, I am going to review the risk management from the standpoints of insurance administration and engineering services, taking an example from those now being conducted by KFPA as a case in Korea.

Firstly, as far as insurance administration is concerned, KFPA has been dealing with the fire lines, writing and issuing the policy, and settling the claims on behalf of ten non life member companies without having any retention, with respect to the specific buildings, and mortgaged objects to the banks. For those free services such as inspecting the specific buildings and insurance handlings, KFPA charges fee of 20% for the premium it collects. Under the KFPA law the specific buildings are high rise buildings, state owned buildings, hospitals and hotel buildings, restaurants, schools, plants, departments and apartments.

Those risks written by the KFPA as above are wholly and equally shared into the ten non life insurers, or the excess over the 10 insurers' retention is ceded to Korea Reinsurance Company.

Secondly, as to the engineering services which can be more active method than insurance administration, KFPA has been conducted the same successfully.

One of major activities done by KFPA in the engineering services is the fire safety inspection of the specific buildings throughout the country.

KFPA's fire safety inspection is classified into the ordinary safety inspection, occasional inspection, seasonal inspection, and confirmation inspection, all of which are entirely free services.

The ordinary safety inspection is conducted whenever a policy is written or renewed. The occasional inspection, literally, is conducted as occasional request.

The seasonal inspection is conducted in such buildings which are highly susceptible to great fire losses as large departments, store buildings, and multiple usage buildings especially during the winter season.

In two major cities in Korea, the capital city of Seoul and Pusan, KFPA's inspectors also conduct inspections of the specific buildings in order to confirm whether the owners of the buildings have complied with the administrative orders for improving the fire fighting equipment and facilities. This sort of inspection is called the confirmation inspection.

KFPA's inspection reports, prepared after inspection, are sent to the administrative agencies concerned, and they, with reference to the recommendations made by KFPA's inspectors, may issue administrative orders to the building owners for improving fire protection systems.

At the same time, KFPA makes recommendations concerning fire problems to the Ministry

of Home Affairs and other Government agencies and some of the recommendations are codified. For example, KFPA made a recommendation to the Ministry of Construction to insert a provision in the related laws or regulations to make it obligatory for the owners to install a heliport on the top of all large scale high rise buildings. This recommendation was adopted by the Ministry and the text of the Presidential Decree of the Building Code was revised. Also, it is prescribed in Article 6 of the Fire Prevention Code that the KFPA's inspection is equivalent to the fire prevention inspection conducted by firemen. The risk management has, as such, been conducted and the KFPA has contributed to the improvement of the nation's fire problem.

Analysis of the recent inspection result reveals the efficiency of the inspection conducted by KFPA (Fig 7)

(Fig 7) Analysis of Inspection Result of the Specific Buildings in Korea

Objects of Inspection (Examples)	Percentage of Unsatisfactory Factors		
	1975	1976	1977
Heating and Cooking Equipment	36.0	20.9	17.2
Emergency Lighting System	79.3	51.3	43.4
Standpipe	55.6	58.9	46.4
General Electrical System	83.3	55.0	51.3

Finally, let me allow to brief the specific building insurance business result experienced by KFPA during the past three years from 1975 through 1977 for 13,000 units as shown below (Fig 8)

(Fig 8) Premium Vs Claim ('75 - '77)

Year	Premium Written		Claim Incurred	
	Number	Amount	Number	Amount
'75	9,584	7,389	85	1,513
'76	10,795	15,795	120	2,737
'77	10,338	20,079	150	2,901
Total	30,717	43,263	355	7,151

For the purpose to reflect the experience of claim in the following inspection schedule, analysis of the claim is made in a different way and manner, which may help deepen the study of fire risk management, develop the fire protection activities of KFPA, and guarantee the profit to all concerned (Fig 9, 10, 11, 12)



(Fig 9) Over-All Picture of Specific Building Claim ('75 – '77)

Classification	Claim Incurred			
	Number	%	Amount	%
Bldg of and over 4 stories	155	43.6	766,602	10.7
Plant	108	30.4	2,809,395	39.3
Department	12	3.4	1,550,274	21.7
Hotel	7	2.0	31,143	0.4
Theatre	4	1.1	43,095	0.6
Market	27	7.6	1,499,055	21.0
Apartment	30	8.5	68,544	1.0
Restaurant	5	1.4	268,830	3.8
School etc	7	2.0	114,396	1.5
Total	355	100.00	7,151,334	100.00

(Fig 10) Causes of Fire ('75 – '77)

Cause of Fire	Claims			
	Number	%	Amount (\$)	%
Electricity	95	26.16	1,223,958	17.1
Oil	26	7.33	79,413	1.1
Floor Heating System (Ondol)	5	1.41	25,576	0.4
Smoking	18	5.07	505,477	7.0
Match	13	3.67	332,241	4.6
Stove	40	11.22	605,516	8.5
Lamp	4	1.13	23,840	0.3
Chemical	7	1.98	110,774	1.5
Mechanical	16	4.51	271,893	3.8
Gas	2	0.57	50,515	0.7
Spontaneous Combustion	2	0.57	26,051	0.4
Playing With Fire	6	1.69	11,297	0.2
Arson	4	1.13	840,584	11.8
Fire Exposure (Spread Fire)	55	15.50	233,598	3.3
Welding	8	2.26	67,370	0.9
Misc	54	15.20	2,743,231	38.4
Total	355	100.00	7,151,334	100.00

(Fig 11) Size of Specific Building Claim Per Cause ('75 – '77)

Cause	Amount Per Unit (\$)
Electricity	12,884
Oil	3,054
Floor Heating System (Ondol)	5,115
Smoking	28,082
Match	25,557
Stove	15,138
Lamp	5,960
Chemical	15,825
Mechanical	16,993
Gas	25,258
Spontaneous Combustion	13,026
Playing with Fire	1,883
Arson	210,146
Fire Exposure (Spread Fire)	4,247
Welding	8,421
Misc	50,801
Total	20,145

(Fig 12) Size of Specific Building Claim Per Classification ('75 – '77)

Classification	Amount Per Unit (\$)
Bldg of and over 4 stories	4,946
Plant	26,013
Department	129,190
Hotel	4,449
Theatre	10,774
Market	55,521
Apartment	2,285
Restaurant	53,766
School etc	16,342
Total	20,145

## CONCLUSION

Let me refer to the basic premium equation being

$$\text{Premium} = (Pxc) + F$$

Where P=Probability of a loss occurring  
 c=Average size of loss which occurs  
 E>Loading for expenses and profit

The first term of the equation (pxc) gives the loss expectancy or pure premium. The probability of loss "p" is estimated by observing the number of times the event occurs during a given time period and dividing this figure by the number of units exposed to loss. As you would become aware KFFA, jointly established by 10 Local Underwriters by virtue of KFFA Law gives its utmost effort to reduce the probability of loss (p) and to minimize the average size of loss (c) at one portion of the expenses loaded in the premium (E) by efficiently effecting inspections on the units exposed to loss by improving the standards of the inspectors and by educating and enlightening the public

It has been generally realized that the evaluation of fire hazards of insurance objects should not rely on statistical methods only and the underwriting survey is desirable to be made by the engineers. Consequently it is recommended that the insurers adopt an active risk management or loss prevention method by means of engineering and education including fire safety inspection and research activities.

It was learned that in Switzerland the so called Gretener Method for systematic determination and evaluation of factors in figures for better risk management has been applied for several years and the result was found to be very successful (The 4th International Fire Seminar held in Zurich in 1973)

Unless the insurers are interested in modern insurance engineering and education to the public for the active risk management the future of insurance business I dare to say seems very dim. Thank you

## 火災特種保險에 있어서의 危險管理

◇	이 글은 1978년 10月初 싱가포르에서開催된 第9次 東亞靑	◇
◇	亞保險會議(EAIC)에서 本協會 業務擔當 李相臣理事가 發	◇
◇	表한 演說文 우리말 譯約으로 主題인 "Risk management	◇
◇	in fire and Accident insurance 의 全文을 함께 揭載	◇
◇	한다 (編輯者)	

### 概要

火保協會는 安全點檢, 調查 研究 啓蒙 保險 消  
 火器機寄贈 資金貸與 等 火保法上의 諸般業務를 遂

行하고 있다 火保協會의 業務性格이 이러하므로 自  
 然히 危險管理(risk management) 全般을 다루지 않  
 고 防火라는 側面에 重點을 두어 論題를 다루었다  
 急激한 經濟 및 現代工學의 發展은 社會文化活動의

樣相에 多樣한 變化를 주었고 防火를 包含한 “危險管理”라는 側面에서 많은 問題點을 던져 주었다 特別 最近 數年間 保險業者들은 未曾有的 大火로 인하여 크게 苦賦하고 있는 중이다 韓國의 경우 1974년부터 3年間 2萬卅 以上の 損害를 내게 한 大火災件數는 全體 火災件數의 14%에 不過했으나 그 被害額은 全體 被害額의 84.5%를 顯示하였다 이러한 傾向은 美國도 類似한데 其他諸國도 例外는 아니라고 여겨진다

大形火災被害의 增加要因으로는 人口의 都市集中 道德觀念의 墮落으로 인한 放火의 增加 工場에서의 自動工程 과정의 增加等 여러 가지가 指摘 되고 있다

한 가지 注目할 事實은 國民總生産 即 GNP와 火災被害는 相關關係가 있다는 것이다 이를 두가지 側面에서 觀察하기로 한다 첫째로 各國의 火災被害增加率을 GNP增加率과 比較할때 前者가 오히려 後者보다 높다는 見解이다

둘째로 先進諸國에서 火災被害가 GNP에서 차지하는 率을 살펴 보면 1950년부터 1974년의 平均은 0.07% 내지 0.32%이나 最近에는 이것이 0.5% 以上으로 增加하였으며 末久에는 1%線까지 될 것이라는 悲觀的인 見解까지 있을 程度이다

火災被害의 大形化는 인플레이와 關係있다는 見解도 있으나 이른 充分히 감안해도 이러한 趨勢는 도저히 否認할 수 없다 그러므로 우리는 앞으로 産業이 發展되고 GNP가 높아 갈수록 大形被害는 더욱 높아 질 것이라는 推定은 充分히 하게 된다

그렇다면 効果的인 火災被害의 減少方案은 무엇인가? 防火弘報 安全點檢 法規改正 放火防止等 여러가지 方便이 있을 수 있겠으며, 이러한 方便들은 積極的으로 保險業務에도 導入되어야 한다 美國의 FM 스위스 防火協會等의 成果는 技術導入으로 인하여 防火效果가 얼마나 擧場되는가 하는 좋은 本보기를 提示하고 있다

韓國에서는 火災로 인한 人命 및 財産上의 損害를 減少시키고 이로 인한 災害를 迅速히 復舊하고 人命被害에 대한 適正한 補償을 하게 함으로써 國民生活의 安定에 寄與하게 함을 目的으로 政府는 1973年 特

別法을 制定하였다 이 법에 따라 “特殊建物”의 所有主는 “身體損害賠償特約火災保險”에 義務的으로 加入하고 火保協會의 點檢을 받도록 되어 있다

現在 火保協會는 10個損保社(社員 會社)를 대신하여 몇 가지 保險種目을 取扱하고 있으며 學收保險料의 20%를 火保協會費로 징수 防災 및 保險서비스 活動에 使用하고 있다

技術 서비스面으로 보면 安全點檢 隨時點檢 特別點檢 確認點檢等은 통하여 通報하며 行政當局은 多大한 成果를 거두고 있다 檢點結果는 關係當局에 이를 土臺로 火災要因을 除去하도록 特建所有主에 行政命令을 내리고 있다 그밖에도 當局에 點檢結果의 分析을 通한 防災上의 問題點解決은 建議하여 法規를 改正하는 데 參考되도록 하는 등 防災를 위해 努力하고 있다

點檢結果改修狀況을 해마다 比較해 보면 各項目別로 火災要因이 점차 改善되고 있음을 알 수 있으며 이로서 點檢의 効果도 立證된다 또한 特殊建物의 罹災도 감소됨으로써 點檢의 効用性은 더욱 確實히 드러나고 있다

基礎保險料方程式面에서 이를 살펴보면 方程式 即 保險料=(Pxc)+E에서 E의 一部를 使用하여 P와 C를 減少시켜(防火活動) 結局 保險料를 引下시킬 수 있다는 相關關係를 立證할 수 있는 것이다

結論的으로 보아 保險對象建物의 火災被害可能性을 調査하기 위해 大數의 法則이나 過去統計에만 依存하던 時代는 이제 지났으며 保險業務에의 技術導入은 매우 바람직 하다는 것이다

스위스에서는 underwriting survey를 함에있어 기술자들이 PMC를 數値로 나타내는 새方法(Gretene Method)이 考案되어 커다란 效果를 거두고 있으며 保險業務 특히 risk management에 技術을 導入한 FM, Kemper 등은 놀라운 發展은 거듭하고 있다 保險業者들이 이같은 例에 따라 새 保險技術 및 啓蒙 危險管理等に 좀더 積極的인 勳勞를 가지지 않는다면 保險産業의 장래는 결코 밝다고 볼 수 없다

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